Illuminating Engineer

XXVII. March, 1934 Price 9

P

c

r

To
pr
te
li
y
M
n
T
n

Plans and calculations correct — yet 'cheap' lamps reduce efficiency as much as 25%

To be sure that your calculation is accurate in practice, you must not only specify lamps in terms of watts, you must specify lamps whose light output is definitely guaranteed—safeguard yourself against the use of inefficient lamps. Philips Measured-Light lamps are guaranteed to give maximum light at their rated wattage. Thousands of tests on the Photometer★ have proved many 'cheap' lamps waste 25% or more of the current they consume, current that never becomes light. This means an error of 25% in your calculations. Your accuracy depends entirely on the exact light output of the lamps used. You must be sure of 100% light. Specify lamps on which you can base your calculations with absolute confidence—Specify Philips Measured-Light Lamps.

★*The Photometer scientifically measures light output against current consumption. It has proved that a 75 watt Philips lamp gives exactly the same light as many 100 watt "cheap" lamps. Ask for a test with the Photometer. The result will amaze you.*

PHILIPS *measured-light* **LAMPS**

MADE IN ENGLAND

PHILIPS LAMPS LTD., PHILIPS HOUSE, 145, CHARING CROSS ROAD, LONDON, W.C.2

Arks

A

Official Journal of THE ILLUMINATING ENGINEERING SOCIETY
FOUNDED IN LONDON 1909
INCORPORATED 1930

The ILLUMINATING ENGINEER

THE JOURNAL OF GOOD LIGHTING

Edited by

J. STEWART DOW

Official Journal of THE ASSOCIATION of PUBLIC LIGHTING ENGINEERS
FOUNDED 1923
INCORPORATED 1928

Vol. XXVII
March, 1934

Price NINEPENCE
Subscription 10/6 per annum, post free

EDITORIAL AND PUBLISHING OFFICES
32 VICTORIA STREET, LONDON, S.W.1
Tel. No: Victoria 5215

Principal Contents:

Towards the Light!

THE days are drawing out. The New Year is well launched. There is a confident belief that the sun of prosperity is rising—that the tide has definitely turned.

"There is a tide . . . which, taken at the flood, leads on to fortune." But it can only be taken if the ship is well found and ready for the voyage. In the same way the factory must be prepared to deliver the goods—to maintain and, if necessary, extend its output at full efficiency.

Now is the Time

Now is the time to overhaul equipment and make good any defects that may have been allowed to develop whilst the industrial sky was obscured by clouds. Now is the time to ensure that we shall secure in full measure our share of the promised prosperity.

May I, therefore, put in a plea for *Lighting*—the very life-blood of a successful factory. There is no job, however simple, that can be done without light; no task that will not suffer if the eyes cannot see easily and well.

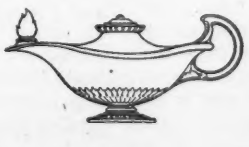
Bad lighting brings a long series of evils in its train—accidents, spoiled work, diminished output, disorderly methods, lack of cleanliness—all these may be caused by insufficient light.

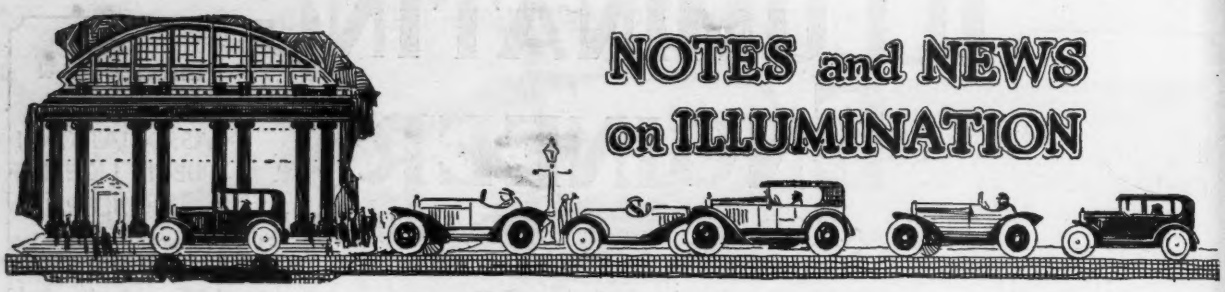
Good Lighting Ensures Profitable Output

Good illumination will furnish the freedom from apprehension and create the sense of power and security which alone enable a man to put forth his best efforts.

Is it not folly to pay high wages to skilled workers and to install costly machinery, and then to grudge expenditure on the lighting which alone will enable both to do their work well? Good lighting, experience shows, forms but a small percentage, frequently less than one per cent., of the total costs of production.

Surely this relatively small expenditure, necessary in order to enable work to proceed smoothly, safely, and efficiently, is *Money Well Spent!*





Electric Discharge Lamps

At the second meeting of the North-Western Section of the Illuminating Engineering Society in Manchester on January 30, Mr. H. R. Ruff gave an entertaining address, illustrated by numerous demonstrations, on Electric Discharge Lamps. Of special interest was the experiment of projecting an image of the column of luminous vapour on the screen so that the process of building up when the lamp was switched on could be studied. An ingenious device revealed the rapid shifting of the column from one electrode to another. Mr. Ruff was also successful in demonstrating the essential difference in regard to revealing of colours between the sodium lamp and lamps based on the use of mercury. The former furnishes a " single line spectrum," i.e., it is really monochromatic. Therefore, a picture containing a series of different colours appears simply as though executed in black, grey, and white.

Colour-Effects in Shopping Centres

Quite otherwise is the effect yielded by the " multiple line spectrum " of mercury which contains vivid lines in the yellow, blue, and green. Many colours showed up well by this light, though the distortion of red-coloured fabrics, which appeared as a species of rusty brown, was considerable. Nevertheless, as Mr. Ruff showed by merely placing a sheet of ruby glass in front of them, these new lamps do possess an appreciable proportion of red. If one may judge from the demonstration reported elsewhere in this issue the problem of obtaining an approximately white light from such lamps has now been substantially solved. But apart from this the effect of their colour in shopping centres has been much exaggerated. In traversing the Wood Green High-road, in which electric discharge lamps have been recently installed, I was struck by the way in which their influence on colours was masked by the effects of supplementary lighting from incandescent and neon lamps in the vicinity; the effect of public lamps on the highly illuminated contents of shop-windows is naturally insignificant.

Visibility in Mist

The misty weather that prevailed on the occasion of the meeting mentioned above (though less paralysing than the fog that descended on the previous meeting in Liverpool) afforded me an opportunity of observing the behaviour of the new lamps on a section of the important arterial road connecting Stockport and Altrincham. My hosts on this occasion pointed out the marked difference in the appearance of this section of the road and less favoured adjacent portions. Certainly there was much greater ease of vision as one entered this brightly lit area. One was not conscious of any disconcerting " blue mist " which by some is said to result from a scattering of the blue rays by mist. I was told, in fact, that throughout the recent fogs traffic on this section of the road has been continuously heavy and remarkably free from interruption.

A Well-Lighted Electric Railway

My return to Manchester was made via the electric railway from Timperley. In at least two respects the lighting of this little railway is remarkably up-to-date. Firstly, in the carriages (even third class), light from a central roof fitting is supplemented by illumination from shaded bracket-lamps received over one's shoulder—an ideal arrangement for reading. Secondly, the name-plates of stations are invariably illuminated —a lesson by which some of the main railway systems might profit!

Home Lighting Standards

I see that the Illuminating Engineering Society of Australia has been occupying itself with this problem. Mr. F. C. Kelly, in a practical paper, recently formulated some sound principles for adoption in the various rooms. People are apt to assume that domestic lighting is mainly a decorative problem. This is hardly true, except possibly in the homes of the rich, where practical requirements are satisfied as a matter of course. But in the average middle-class home, only a few of the rooms give much scope for decorative lighting. In bathrooms and kitchens, certainly practical needs come first. (It would not be a bad plan for the designer to start *first* with the kitchen, the lighting of which is so often scamped!)

Speed the Parting Guest!

Mr. Kelly also alluded to one or two phases of domestic lighting apt to be overlooked, such as the illumination of the number of the house and the flood-lighting by night of the path to the front door and from the house to the garage. In these days of progress it is surely an anachronism that the name or number of a house should be indistinguishable by night; it should likewise be an elementary rule of hospitality that the departing guest should be not merely speeded, but lighted, on his way.

Street Lighting by Signs

It is, I believe, a familiar fact that the illumination afforded by the electric signs in Broadway, New York, greatly exceeds that furnished by the public lamps. Even in this country the aid of such supplementary private lighting is not to be despised. This point, *Signs* records, was urged on behalf of the Electricity Department of the Pudsey Corporation, which has recently fixed a neon sign over the entrance to their showroom. In reply to a criticism that £35 was an excessive price to pay for this publicity effort, it was stated that complaints had been made of inadequate lighting in this part of the main street. The sign also served as a substitute for a public lamp.

Good Industrial Lighting

Courtesy Messrs. Holophane, Ltd.

What Constitutes *Good* Industrial Lighting?

WHAT constitutes *Good*, not merely adequate, but *Good* Factory Lighting? This question we shall try to answer in a series of articles, of which this is the first. We shall deal in turn with all the fundamental principles of good lighting. We shall also try to give chapter and verse for these principles by quoting actual cases where observance of them has proved of benefit. We shall try to suggest solutions of the many thorny problems that beset the path of the conscientious engineer-in-charge, in whose hands the lighting of the factories and workshops of this country so largely rests.

Our question, therefore, cannot be answered both instantly and completely. There is no royal road to excellence in factory lighting, because every factory is really a problem in itself. In many cases it is the user of the light who alone understands exactly the task which the workers and the machinery are asked to perform, and who must ultimately determine the selection and positions of lighting units. Each trade process involves different requirements. In one case good general lighting will answer, in another well-shaded local units must be used; in a third instance colour of the light may be of vital importance; in yet other cases provision against depreciation through dust or corrosion by fumes may be the dominant consideration. But whatever method be adopted, make no mistake about it the lighting is important. Light is the master tool which every factory must use, which paves the way for all other tools to do their work.

Subject to this fact—that each industrial process presents special problems of its own to the lighting engineer—we can go a certain distance towards defining good industrial lighting in general terms: that is to say, we can state certain principles with which *all* installations should comply, namely:—

(1) **Sufficiency of Light;** that is, ample illumination at the actual spot where work is performed.

(2) **Reasonably Uniform Illumination** over the Working Area.

(3) **Absence of Glare or Dazzle;** either caused by the lamps themselves or by reflections of their light in highly polished surfaces.

(4) **Avoidance of Troublesome Shadows;** such as those caused by the head or body of the operator falling between the light and the work.

(5) **Constancy of Light;** that is elimination of flicker such as may arise when electric lamps run off a fluctuating voltage or gas pipes or burners are partially choked.

(6) **Proper Maintenance of Light;** an installation excellent when first installed, may be quickly ruined by neglect.

To these six main principles may be added several other conditions of varying importance according to the nature of the job. For instance:—

(7) **Colour of Light** is obviously of vital importance in certain industries, such as dyeing, involving accurate matching of colours, and it may be of more or less importance in other special cases.

(b) **Sufficient Contrast** between an object and its background may be a vital condition in certain processes and excessive contrast a special danger in others.

(8) **The direction from which the light comes** may play an important part in certain tasks.

(9) Special precautions against **depreciation through dust or fluff or corrosion** by atmospheres containing chemical fumes or much moisture may be necessary.

(10) In the case of processes involving **observation of rotating machinery** the peculiar optical

effects may occur when the moving parts are illuminated by gaseous sources of light run on a.c. circuits and thus undergo cyclical changes in brightness.

These last considerations, and certain others applying to special industries, we shall take up when we come to details. For the moment let us consider further what our six main principles require us to do.

(1) **Sufficiency of Light.** What exactly do we mean when we say that an office or a factory receives sufficient light? Really we mean two things, (a) that the brightness of the things our eyes have to examine in the course of our work is great enough for us to do so with ease, and (b) that the remaining parts of the room, over which our eyes rove casually, are agreeably lighted—not merely sufficiently for us to see our way about but amply so as to produce an impression of confidence and cheerfulness, which an ill-lighted room invariably fails to do.

The first condition, therefore, assumes sufficient illumination on the "working area" which can be specified in foot-candles irrespective of the nature and positions of the sources producing this illumination. (A "foot-candle" is the illumination produced by a source of one candle-power at a distance of 1 ft. on a surface at right angles to the direction from which the light comes. This same illumination might be produced in many different ways: for example by one source of nine candle-power 3 ft. away or by five sources each of twenty candle-power and each 10 ft. away.)

The value of this "working illumination" naturally varies according to the task and the amount of light reflected from the material. There is at present no legal or statutory standard of factory lighting in this country, but a rough indication of the minimum desirable is afforded by the recommendations of the Departmental (Home Office) Committee on Lighting in Factories and Workshops, which reported in 1922. That Committee recommended that 3 foot-candles should be available for fine work and 5 foot-candles for very fine work. This, be it observed, is *a minimum*. In a modern up-to-date factory, 8 to 10 foot-candles is quite usual, and should answer for all but the most exacting processes, for which local lighting may be necessary. (It is convenient to remember that this order of illumination is obtainable with a consumption per square foot of floor area of approximately 1 watt per square foot for electric gas-filled tungsten lamps and 1-10th of a cubic foot per hour of gas, modern methods of direct lighting being employed.)

In cases where a room is occupied by a number of people all engaged on identical tasks, and which is evenly flooded with light, the working illumination is also the general illumination. But when the total area of the room much exceeds the working space, some consideration to the former should be given. The general illumination in these remote parts should not be less than 1, and preferably not less than 2 foot-candles.

"Good Lighting in Factories and Workshops is of great importance to the Health of Workers and for the Prevention of Accidents and has ALSO A CONSIDERABLE EFFECT ON OUTPUT."

This remark was made in the House of Commons by Sir George Cave, when Home Secretary, nearly twenty years ago. How much more true are his words to-day.

(2) Absence of Glare. "Glare" or "Dazzle" is found in an extreme form when our eyes encounter the beam of a motor-car headlight on a dark road. But all unduly bright things dazzle the eye to some extent. They have a double action: (1) causing discomfort; and (2) making it more difficult to see. The glare from exposed bright filaments, falling in the direct range of vision, must add to the fatigue of the eyes during a long day's work. In some cases (e.g., when a bright light is placed near an exposed cutting edge) glare may be positively dangerous. What sources, therefore, can be considered glaring? The answer must depend on the background and the state of the eyes—even the light from a match causes complete dazzling of the eyes on a dark country road. But in

Two illustrations which shew clearly the improvement in a laundry after good lighting had been installed. Note the increased cheerfulness, the facility of vision and the "clean" atmosphere of the second view as compared with the first.

Courtesy, The General Electric Co. Ltd.

general, any source whose brightness exceeds that of a candle-flame is in some degree glaring, if coming within the ordinary direction of view. It is usually assumed that the brightness of such sources ought not to exceed five candles per square inch—a condition that is easily met when filaments or mantles are screened by diffusing glass globes.

If, as often happens, one prefers to use lamps in open reflectors, so that the filament or mantle is liable to be exposed to view, there are two things one can do to diminish glare: (a) use a reflector of scientific contour and design which at least partially screens the source from view; or (b) mount all the lamps high up, well out of the ordinary range of vision. It is by no means unusual for a person sitting or standing in a well-lighted factory to be able to look straight across the room without seeing a single mantle or filament. This is not a counsel of perfection, but a condition that can quite frequently be met!

(3) Avoidance of Troublesome Shadows. There is no need to point out the awkwardness and occasional danger of shadows cast by the head or body of the operator, or by portions of the machinery, falling between the light and the work. When, as sometimes happens, the projecting machinery is in motion it gives rise to rapidly moving shadows which are specially distracting. Overhead belting is liable to cause such shadows, and direct coupling of motors, avoiding all connections to overhead shafting, is helpful in this respect and makes the lighting of a workroom from above very much easier.

Avoidance of troublesome shadows is mainly a matter of careful selection of positions of lights.

Another form of glare is experienced when the light from bright sources is reflected directly into the eyes from glazed or polished surfaces. This is apt to cause trouble in such trades as cutlery, silverware, and the making of safety razor blades—all things that are highly polished and must be closely examined. The remedy lies partly in the careful placing of lamps so that their light is not reflected at inconvenient angles and partly in screening them with diffusing glassware, which reduces their brightness to a moderate value.

The screening of lamps by diffusing glassware and the use of light colours for walls and ceilings, which scatter and diffuse the light, both help considerably in softening shadows, besides tending to reduce excessive contrast and glare.

On the remaining points not much need be said. Electric incandescent lamps run from the mains of a supply undertaking should give a steady light. In the case of private installations, e.g., when current is supplied from dynamos driven by gas engines, fluctuations in voltage are liable to occur, and may result in pulsations of light. The defects that usually cause flickering of gas lights, faulty adjustment of burners, or partial stoppage of pipes, are readily remedied, and should not occur in any efficiently maintained installation.

Proper maintenance of lighting installations, on which the preservation of their original efficiency so greatly depends, is the subject of a special article in this number. (See pp. 74, 75.)

New Street Lighting at Enfield

WE recently had the opportunity of inspecting the first street lighting installation with electric discharge lamps centrally suspended, which has recently been completed in Church-street, Enfield, Middlesex.

It is claimed that this is the best example so far of lighting by this type of lamp, and the effect produced certainly left little to be desired as regards the intensity and distribution of the light. The peculiar colour of the light obtained from this type of lamp is naturally something of a drawback, and there is still a good deal of room for improvement in this direction.

As against this the lighting itself is really excellent, and a very great improvement over the old system.

Lighting by "Escura" Lamps in "Enfield" Lanterns.

This photograph shews the Main Street of Enfield Town, after the installation of "Escura" Lighting.

The lamps used are the Royal "Ediswan" Escura electric discharge lamps, in "Ediswan" Enfield directional lanterns suspended twenty-five feet above the centre of the roadway. Single units are spaced at intervals of forty to fifty yards in the narrowest part of the street and two units per span are used to cover the extra width at the eastern end of the street. Double suspension wires are used throughout to prevent the lanterns from swaying.

Keep Upkeep Down!

THERE is an old Irish story of our youth which concerns a very stupid farmer who purchased for a large sum of money a magnificent cow. Some weeks later the cow was observed to be wasting away, and very soon she died.

It was then revealed that the cause of the cow's death was starvation, and the farmer was asked by his friends why he had neglected to feed her. "Begorrah," he said, "sure an' she *cost* me fifty pounds, would I be after spendin' even more money on *feedin'* the baist?"

That story has a moral which might well be taken to heart by all maintenance engineers.

The subject of maintaining an artificial lighting installation in an efficient condition is so comprehensive, and involves so large a number of considerations, that it cannot be dealt with here at any length. Let us, however, consider a few of the more salient points as they occur to us. Firstly, as to the *necessity* for regular and efficient maintenance.

A series of comprehensive tests were recently put in hand by a research committee to determine the extent to which a lighting installation might deteriorate in efficiency owing to the accumulation of dust and dirt, the presence of discolouration, or other similar causes.

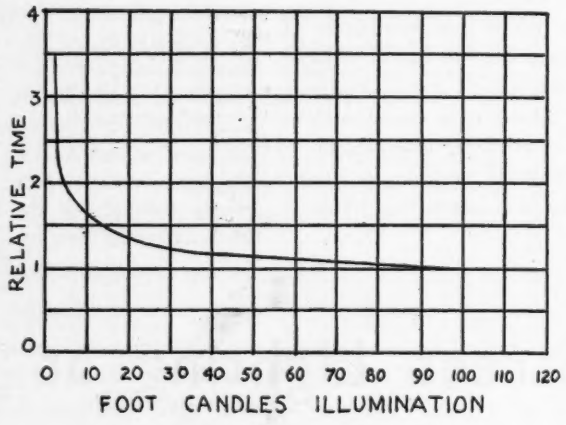


Figure 1.
An interesting diagram which shows clearly the effect which dirty lighting equipment and consequent low foot-candle intensities can have on the speed of vision.

Their report showed that the ordinary lighting fitting can lose as much as 30 per cent. of its efficiency in a short time if left uncleaned.

Let us consider this statement—suppose we take for example a factory whose total lighting load is 90 k.w. The lighting installation is of first-class equipment using new lamps and a general overall intensity of 15 foot-candles is obtained. Now suppose we visit that factory four months later, no attempt at scientific maintenance having been made meanwhile. We find that the load is, of course, unaltered, but our overall intensity has been reduced to 10 foot-candles.

More briefly still, the factory is paying for 15 foot-candles but is receiving only ten.

Nor, unfortunately, is this case in any way out of the common; indeed, it is a regrettable fact that a really well-maintained installation is the exception rather than the rule.

In the same way that the farmer must feed his cow if he is to obtain profitable output from her, similarly the maintenance engineer or similar authority must go to the comparatively small trouble of ensuring the regular and adequate cleaning of his lighting equipment if he is to receive the benefits which are his due, and for which he is paying both in equipment and in current.

Of course, although the equipment must necessarily be his primary consideration, yet we must not overlook the other important factors, all of which come within the scope of maintenance in one form or another.

Consider the question of surrounds; that is to say, the walls and ceilings which are adjacent to the lighting and to the working plane below. These surrounds play a most important part in reflecting the light back on to the work, and their colour and appearance must enter into any considerations affecting the general efficiency of the installations.

Glance for a moment at the table of comparative reflection factors given below.

Aluminium Paint	72		
Black Paint, Matt	6		
Brick, Dark	22		
Brick, Light	46		
Buff, Light Matt	36		
Caen, Stone	72		
Concrete, Unpainted	45		
Cream, Matt	62		
Galvanised Iron	16		
Glass, Ordinary	14		
Grey, French Matt	28		
Grey, Dark Matt	22		
Green, Light Matt	41		
Green, Dark Matt	27		
Ivory, Glossy	69		
Ivory, Matt	64		
Plaster	75		
Plaster Board	60		
Red Carmine, Matt	9	Steel, Unpainted	16
Tile, White Glossy	80	White Blotting Paper	82
White Paint, Glossy	78	White Paint, Matt	77

Notice how dark brick reflects only 22 per cent., or just over a fifth of the light falling upon it; while plaster or, better still, white glossy tile reflects as much as 80 per cent.

In point of fact, white blotting paper gives, as will be seen, a factor of 82 per cent., but white matt-surfaced walls are not a proposition commercially on account of the trouble in cleaning. Glossy white is the ideal on account of the ease of washing down, and because of the extremely high reflection factor.

Of course, it is not always possible to have glazed tiles around the factory or workshop, but in all cases the maintenance engineer should insist that the walls be as light as possible, and that they be kept perfectly clean.

There are several other considerations which we must not neglect here. Let us consider firstly the vexed question of lamps.

We cannot emphasise too fully the false economy of continuing to use lamps which have given their best

MAINTENANCE & CLEANING CHART for LIGHTING INSTALLATION

LOCATION	INITIAL INTENSITY	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
		INT	CL	INT	CL	INT	CL	INT	CL	INT	CL	INT	CL	INT	CL	INT	CL	INT	CL	INT	CL	INT	CL	INT	CL
FOUNDRY	10	10	-	9·5	-	8·5	X	10		9	X	10	-												
MACHINE SHOP	12	12	-	12	-	11·5	-	11·0	X	12	-	12	-												
ASSEMBLY	10	10	-	10	-	9·5	-	9·0	X	10	-	10	-												
DESPATCH	6	6	-	⑤	-	6	-	6	-	5	X	5	-												

N.B. *Tests to be taken on 1st of each month. Mark with X when cleaned*
⑤ *Indicates lamp burned out and replaced*

Figure 2.

A typical maintenance and cleaning chart which is easy to draw up, easy to keep up, and easy to read. A glance at the figures with their relative cleaning dates will prove of interest.

service and need replacing. It is very easy, so long as the filament remains intact, to leave a lamp where it is; it is also very hard to condemn such a lamp and to destroy it out of hand. Yet it is a many times proven fact that such lamps are definitely uneconomical, they do not give the light for which you are paying, and it is well to bear in mind in this connection that a lamp during the course of its life (especially if that life is unduly prolonged) consumes many times its own value in current. One may summarise this paragraph thus—current costs more than lamps; make the most of the current you pay for by using good lamps. Another point for the maintenance engineer to watch. Do you get a voltage drop at the lamp-holders? This may be caused by a variety of causes, such as an overload on the circuit or bad wiring, with an insufficiency of copper content.

A reduction of 10 per cent. on the true voltage results in a decrease of 33 per cent. in the candle-power of the lamp when rated at the normal voltage. Of course the wattage consumption would also be decreased by about 14 per cent., and since the decrease in available light is 19 per cent. greater than the decrease in wattage, it will be apparent that the efficiency of the lamp is also decreased by 19 per cent.

The lower wattage consumption will naturally result in a lower operating cost as far as the current consumed is concerned, but as the decrease in illumination is more than double this figure the net result is a loss.

Therefore—avoid voltage drop.

Now as to the actual procedure of maintenance—this can only be dealt with briefly, but there is one point which should be rigorously observed; that is, that maintenance must be done systematically. It is not the slightest bit of good sending an occasional man around the factory with instructions to "have a look at the lighting and clean any dirty reflectors you can find." The cleaning of lighting equipment should take place at regular intervals, preferably once a month, and preferably on the same day in each month, so that any slight disorganisation (which can in any case be reduced to a minimum by tact and foresight) shall not come at an unexpected moment.

A chart, properly drawn out, should be provided, and the foreman or individual responsible for each shop or part of the factory should be detailed to see that the chart is filled in regularly by a man definitely detailed for the work.

Notes, such as re-lamping, etc., should be made on the foot of the chart, and wherever possible the actual intensity available before and after cleaning the equipment should be taken by means of one of the many available light-measuring instruments. Thus any untoward drop in the lighting yield can be quickly spotted and attended to.

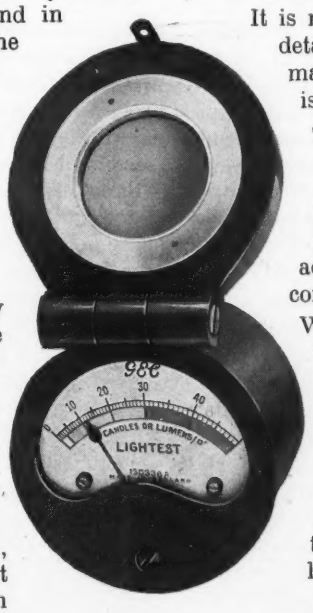


Figure 3.

It cannot be too strongly emphasised that an adequate check must be kept on the lighting by means of a proper scientific measuring instrument.

The eye alone cannot determine readily the change in intensity, and it is often not until production itself starts falling off that the lighting is found to be at fault.

Here is a typical light measuring instrument, known as a "foot-candle meter," of a type which no maintenance engineer should be without.

It is not within the province of this article to detail the actual methods by which equipment may be cleaned. Usually such information is available from the manufacturers of the equipment which is being used, and in any case it is largely a matter of common sense.

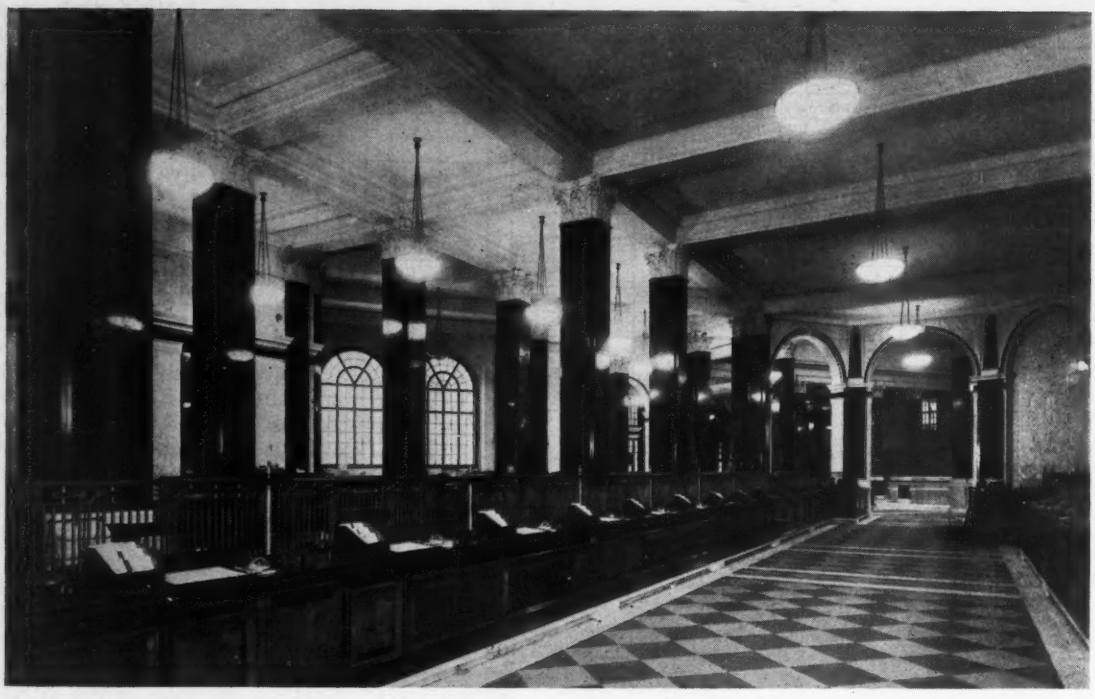
Lamps, reflectors, surrounds, they must all receive attention, if the manifold advantages of good lighting are to be continually felt.

We would stress finally the advisability of using some form of light-measuring instrument—the gradual depreciation of a lighting installation is extremely insidious, and the eye adjusts itself to a decrease in illumination so readily that frequently it is not until the output of good work starts to drop off that the trouble is noticed and traced to the lighting.

Maintenance engineers, remember the Irish farmer—remember that installations of good lighting equipment cost money, current costs money, but maintenance costs proportionately so little.

Lighting is a potent profit-earner—maintain your lighting efficiently, and the profits will look after themselves.

We are indebted to the Benjamin Electric, Ltd., and the General Electric Company, Ltd., for the illustrations appearing in this article.



Modern Office Lighting

THE modern office presents a great contrast to that of a generation ago. Many of us can remember conditions not unlike those sometimes pictured by Dickens—dusty interiors at the top of a flight of stairs where the dust of ages had accumulated, where daylight was dim, and artificial lighting almost non-existent, when handwritten correspondence effected in days what a telephone conversation now accomplishes in minutes, when work pursued its laborious, leisurely, and interminable course. In such offices long hours were worked though the output of work, judging by modern standards, was poor. Darkness and lack of method together bred disorder.

To-day the coming of abundant artificial light has enabled work to be continued with ease after darkness has fallen. But it has also changed the whole outlook on office work. When dirt is manifest it can no longer be tolerated; when disorder is evident it becomes an offence. Better lighting, together with more efficient office appliances and machinery, has encouraged methods of precision and tidiness. The desk of the modern business man is no longer littered with papers. Filing cabinets receive at once what is no longer needed. Business is promptly despatched, and its traces removed and recorded.

The revolution in methods of light is not merely one of intensity. It is true that in the modern office 10 foot-candles are usual as compared with the meagre 2 foot-candles which used to be regarded as completely satisfying the needs of the human eye. But equally important has been the substitution of powerful but well-screened overhead fittings, instead of the unsightly drop-cord pendants distributed at irregular intervals according to the positions of furniture. The symmetrical distribution of enclosed diffusing units at a height of say 8-10 feet above floor level permits a clear view of the room. If well diffused illumination of the value of 8-10 foot-candles is available everywhere over the working area, the positions of desks and typewriters can be altered at will. It is not necessary to rearrange the positions of lighting points every time the office furniture is rearranged.

Note well, we say " well diffused " illumination. What exactly does this term mean? Well, it means in the first place that filaments or mantles are screened by diffusing glass. In many offices open reflectors are used, and certainly they have certain merits. But in the writer's opinion nothing can compensate for the advantage of having the source completely screened, so that glare is absent, and, what is also important, harsh shadows are eliminated. In the second place well diffused illumination means that the surroundings, walls and ceilings, are all called into service as distributors of light. Ceilings should always be white and walls always of a light colour, such as cream, buff, or pale green, if really satisfactory lighting is to be obtained. For, in the modern office, it is most expedient that much of the light should fall on the walls and ceiling, and by them be scattered about the room. In these circumstances light reaches any special object, the surface of a book for example, from many different points. No dense shadow can therefore be cast by the head or the hand. Within limits it does not matter where in the room a table or a typewriter is situated.

The exact method in which light is distributed may vary according to the needs of the office. There is

An excellent example of diffused lighting by means of ceiling mounted commercial diffusing units. Note the even distribution of the light and the absence of harsh irritating shadows.

much to be said in favour of semi-indirect lighting, in which a large proportion of the light is directed upwards on to the ceiling, with a corresponding softening of shadows but with a certain loss in efficiency. But even in the case of most modern systems regarded as "direct," much of the light should still reach the ceiling, and especially the walls, where vertical objects, bookshelves, charts and filing cabinets also require light.

Such surfaces often require examination at close quarters, and we all know how easy and how provoking it is to find oneself with the head in one's own light, casting a shadow on the very thing we are examining. This offers another reason for preferring semi-indirect lighting, such that light received from the ceiling forms an important proportion of the whole. For the ceiling is such an extensive source that it can cast but slight and soft shadows; it can also "get round the corner" and illuminate, penetrate into crannies, illuminating the inside of an open drawer or the interior of a desk when the lid is raised.

There is just one other respect in which well-diffused methods of lighting assist office work, namely in diminishing the troublesome effect of reflection of light from glazed paper. It is no doubt true that by careful placing of light-sources this troublesome shine can be largely overcome. But what one would like is a room so lighted that a book can be read anywhere, or even tilted at any angle without the effect of shine becoming too evident. The fact that the light comes from extensive luminous surfaces of moderate brightness, such as an opal globe with a mantle or electric lamp inside or an illuminated ceiling, greatly diminishes this tendency to glare, in the form of reflected light.

These, then, are the valuable qualities involved in good diffusion. Whilst semi-indirect lighting—a mixture of reflected and directly transmitted light—is specially well adapted to furnish these qualities, it should not be assumed that an open bowl is necessary or even desirable. There are now obtainable forms of enclosed lighting units giving what is substantially a semi-indirect effect. There is no need to emphasise the advantages of such units from the maintenance standpoint. Open reflecting bowls inevitably collect dust, and dust quickly causes a big drop in the available illumination—as any office user can test for himself.

The lighting of the great majority of offices can be treated on these lines. It was formerly customary in certain cases—banks for instance—to assume that local well-shaded lamps are essential, and that requirements could not be met solely by general overhead lighting. This impression, however, was largely due to the fact that there was good ground for this belief at one time when sufficiently powerful and efficient lamps were not available to enable good general lighting of 8 to 10 foot-candles to be economically obtained. But the advent of advance in efficiency of lamps has removed this difficulty. To-day it is quite usual for banks to adopt general lighting, which system has the additional advantage that modern diffusing fittings may be, can be, so designed as to form an impressive and dignified addition to the general scheme of decoration.

This last consideration is well worth study. Good lighting has a psychological influence as well as a material one. A well-lighted interior immediately forms, creates a favourable impression, and creates a confident and satisfied mental attitude. Visitors to an office that is dingy and ill-lighted are less favourably impressed. Darkness has long been associated with pessimism and despondency! Let us then do all in our power to ensure good lighting in the office.

First impressions count! The modern suite of offices should ensure a bright and cheerful atmosphere in the waiting room. This photograph strikes one at once with its general air of cleanliness and efficiency.

We acknowledge with thanks permission to reproduce the illustrations in this article from The Benjamin Electric, Ltd., and The General Electric, Ltd.

Some Observations on the Use of Electric Discharge Lamps

(Communicated)

The above is a Mazda Mercra installation which demonstrates the versatility of this type of lighting and also the economy in units effected by this new type of illumination.

THE writer has been asked to say something about the possibilities of electric discharge lamps for industrial work. For street-lighting they are already familiar—there are, one gathers, somewhere between 50 and 100 such installations in being. But we have not heard very much about their value in factories.

A few and apparently quite successful installations have been reported. The advantages of having a lamp giving approximately 2½ times as much light as the ordinary gas-filled filament lamp are obvious. The greater efficiency will, one may hope, be applied to give more generous illumination rather than to economise in consumption. From the industrial standpoint the fact that the light comes from a column of vapour rather than a single bright point should also be an advantage in giving good diffusion and soft shadows. Any possible difficulty in producing a highly concentrated beam of light is here no drawback.

The two limitations that most readily occur to one are associated with size and colour. An installation of 400-watt units, each yielding about 16,000 lumens, is well suited to a large area. One would, however, prefer units of lesser power (which will doubtless make their appearance before long) in a room of moderate size.

The next point, of course, is the colour. This drawback, it would appear, is well on the way to solution, as lamps of equal efficiency, giving what is substantially a white light, have already been announced by a leading firm of lamp manufacturers. But, apart from this, it does not seem that the colour of the light is likely to cause much objection, once operators have become accustomed to it. (The writer was informed of one case in which workers (1) objected; (2) were persuaded to persevere; and (3) clamoured for its return when such an installation was temporarily replaced by the filament lamps formerly used!) In certain cases, for example, in a forge or foundry or glassworks where red glowing objects have to be scrutinised, the comparative absence of red from the spectrum might possibly be an advantage.

In any case, the announcement referred to above suggests that ultimately the colour of these lamps will come under control; that is to say, the maker may be able to furnish lamps giving substantially white light, accurate white light for colour-matching, or highly-coloured light involving combinations of spectral colours at will! This control of quality, besides intensity, is one of the dreams of the illuminating engineer.

There remains one effect of these lamps on which little has been said, but which may prove an important one in certain circumstances. All such gaseous lamps, running on an alternating current supply, undergo rapid fluctuations in light, in time with the reversals of current.

When stationary objects are illuminated by such lamps the fact that the light is thus varying is of no consequence. On the frequencies usual on electric supply systems the reversals occur too rapidly to be distinguished by the human eye. But when moving objects, and especially rotating objects, are illuminated curious "stroboscopic" effects may occur. A rotating pulley may, for example, appear to stand still, or may even be apparently reversed in direction of rotation. So well is this recognised that a special form of apparatus, comprising neon lamps run on an a.c. supply of graduated variable frequency, has been devised for the inspection of intricate moving machinery. Some years ago, Dr. J. F. Crowley demonstrated before the Illuminating Engineering Society how by such means the needle of a sewing machine could be gradually slowed down and even apparently made to stand still, though really in rapid motion.

Skilfully used these "stroboscopic" effects put a new weapon in the hands of the illuminating engineer. But their existence suggests that some caution should be used in applying the new lamps to processes involving the use of rapidly revolving machinery. It is somewhat singular that such effects do not seem to be observed to any material extent in the streets. The writer is informed that in the case of most industrial operations, involving relatively slow rotations of the order of 500 or less revs. per minute, little effect is observed. It is suggested, however, that in trades requiring machinery to be run at high speeds of 1,000 r.p.m. or more, troublesome "stroboscopic" effects may be observed. It is here, therefore, that caution seems necessary!

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Illuminating Engineering Society

Notes on Recent Meetings and Events

A MEETING of the Illuminating Engineering Society took place in the Lecture Hall of the Institution of Mechanical Engineers (Storey's Gate, London) on Tuesday, February 20. Members assembled for light refreshments at 6.30 p.m., and the chair was taken by the President (Mr. C. W. Sully) at 7 p.m.

The Minutes of the last meeting having been read, the HON. SECRETARY read out the names of applicants for membership, which is appended. The names of those presented at the last meeting on January 9 were read again, and these gentlemen were formally declared members of the Society. These names (which were inadvertently omitted from our last issue) are as follows:—

Country Members:—

Ostler, A. H. ..... Bristol Corporation Electricity Dept., Colston Avenue, BRISTOL.

Springsgieth, C. E. ..... Consumers' Engineer, 14, Llanfair, Penygraig, Rhondda, S. WALES.

Stancombe, T. R. ..... Bristol Corporation Electricity Dept., 10, St. Matthews Road, Cotham, BRISTOL.

The PRESIDENT then called upon MR. H. BUCKLEY to read his paper on "Heterochromatic Photometry," in which special reference to the problems encountered in dealing with the new electric discharge lamps was made. The paper led to an interesting discussion, in which the following took part: MR. C. C. PATERSON, MR. G. T. WINCH, PROFESSOR J. T. MACGREGOR MORRIS, MR. P. D. OAKLEY, MR. J. S. PRESTON, DR. E. H. RAYNER, MR. L. J. DAVIES, MR. J. M. WALDRAM, MR. E. L. DAMANT, and MR. A. W. BEUTTELL.

After Mr. Buckley had replied, and had been accorded a hearty vote of thanks for his paper, the President announced the forthcoming meetings, particulars of which are given below.

Mr. Buckley's paper and the ensuing discussion will appear in our next issue, which will also contain an account of the special meeting held in Birmingham on February 28.

Applicants for Membership.

Corporate Members:—

Barford, A. R. ..... Lighting Trades, Ltd., and Welsbach Light Co., Ltd., 51-55, Garratt Lane, WANDSWORTH, S.W.18.

Clarke, H. T. ..... The Gas Light and Coke Co., 8, Deans Way, Edgware, MIDDLESEX.

Elvy, J. C. ..... Consulting Engineer, 32, Shaftesbury Avenue, LONDON, S.W.1.

Fickling, L. A. ..... Linolite, Ltd., 96, Victoria Street, LONDON, S.W.1.

Gould, J. A. ..... South Suburban Gas Co., Distributing Engineer's Dept., LOWER SYDENHAM, S.E.26.

Huston, W. C. ..... The British Thomson Houston Co., Ltd., Crown House, Aldwych, LONDON, W.C.2.

Kemp, J. ..... The British Thomson Houston Co., Ltd., Crown House, Aldwych, LONDON, W.C.2.

Perkins, T. ..... The Gas Light and Coke Co., 25, Buckingham Road, Dalston, LONDON, N.1.

Phillips, Capt. I. G. E. ... Electrical Engineer, 3, Ashworth Mansions, LONDON, W.9.

Sinclair, J. ..... The Gas Light and Coke Co., "The Birches," Inwood Road, Hounslow, MIDDLESEX.

Walker, J. W. ..... The Gas Light and Coke Co., Gas Works, Union Street, STRATFORD.

Country Member:—

Hadley, H. S. ..... 10, Marsden Street, MANCHESTER.

Affiliated Students:—

Hanks, R. L. ..... The Benjamin Electric, Ltd., Tariff Road, Tottenham, LONDON, N.17.

Thompson, J. J. ..... College of Technology, Manchester, 9, Chatham Grove, Withington, MANCHESTER.

Wilkins, E. L. ..... The Benjamin Electric, Ltd., Tariff Road, Tottenham, LONDON, N.17.

Forthcoming Events

The **Next Meeting** of the Society will be held at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, on **Tuesday, March 13th,** when MR. R. O. SUTHERLAND will present a paper on **"The Aesthetics of Electric Lighting in Architecture." 6.30 p.m.**

A **Special Meeting** will be held at the College of Technology, **Manchester,** on **Thursday, March 15th,** when a short address on **Progress in Illuminating Engineering** will be given by THE PRESIDENT (Mr. C. W. Sully), and will be followed by a Display of Exhibits illustrating recent advances. **7.15 p.m.**

Illuminating Engineering Society

(Founded in London, 1909; Incorporated 1930).

Election of Officers and Council Session 1934—1935

OFFICIAL NOTICE

IN accordance with the procedure specified in the Articles of the Society, a list of existing Officers and Members of Council, of vacancies occurring and of duly qualified persons nominated by the Council for vacancies about to occur in the offices of President, Vice-Presidents, Hon. Treasurer, Hon. Secretary, and Ordinary Members of Council, is presented below for the information of the Members of the Society.

In the event of any Members desiring to put forward other names, the Council will be pleased to receive such nominations, which should be made in accordance with the following rule (Article 48):—

> "After the issue of the Council's list, and not later than the *15th day of April* next following, any ten Members (but no more than ten) may nominate any other duly qualified person to fill any such vacancy by delivering such nominations in writing to the Hon. Secretary, together with the written consent of such person to accept office if elected, but each such nominator shall be debarred from nominating any other person for the same office at such election."

Present Officers and Members of Council

President*:—*Mr. C. W. Sully

***Past Presidents*:—**

Sir WILLIAM BENNETT, K.C.V.O., F.R.C.S.
Mr. A. P. TROTTER, M.INST.C.E.
Sir JOHN HERBERT PARSONS, C.B.E., F.R.S.
Mr. D. R. WILSON, C.B.E.
Mr. C. C. PATERSON, O.B.E., M.I.E.E.
Dr. J. W. T. WALSH, M.A., D.SC., M.I.E.E.
Lt.-Col. K. EDGCUMBE, T.D., M.INST.C.E., M.I.E.E.
Sir FRANCIS GOODENOUGH, C.B.E.
Lt.-Com. HAYDN T. HARRISON, M.I.E.E., R.N.V.R.

***Vice-Presidents*:—**

Mr. H. Hepworth Thompson (1931)
Mr. A. W. BEUTTELL (1932)
Mr. A. CUNNINGTON (1933)

***Members of Council*:—**

Mr. A. C. CRAMB (1933)
Mr. R. S. DOWNE (1932)
Mr. J. Eck (1931)
Col. C. H. SILVESTER EVANS (1932)
Miss C. HASLETT (1933)
Mr. C. HUGHES (1932)
Mr. A. E. ILIFFE (1933)
Mr. W. J. JONES (1932)
Mr. STEPHEN LACEY (1933)
Mr. S. B. Langlands (1931)
Capt. W. J. Liberty (1931)
Mr. C. A. MASTERMAN (1932)
Mr. W. Millner (1931)
Mr. T. E. RITCHIE (1933)
Mr. Howard Robertson (1931)
Mr. ERNEST STROUD (1933)
Mr. J. C. Walker (1931)
Mr. H. C. Wheat (1931)
Mr. G. H. WILSON (1933)

***Hon. Secretary*:** *Mr. J. Stewart Dow* (1928)

Hon. Treasurer*:—*Mr. Percy Good (1933)

Nominated by the Council to fill Vacancies

***President*:—**Mr. H. HEPWORTH THOMPSON

***Vice-President*:—**Mr. S. B. LANGLANDS

***Members of Council*:—**

Mr. W. A. BISHOP
Mr. H. BUCKLEY
Mr. J. G. CLARK
Mr. GEORGE HERBERT
Mr. WALDO MAITLAND
Mr. A. B. READ
Mr. JAMES SELLARS

***Hon. Secretary*:—** Mr. J. STEWART DOW

***Hon. Treasurer*:—**Mr. PERCY GOOD

The names in italics are those of retiring Officers or Members. The date in parentheses after each name indicates the date of election to Office or Membership of the Council.

Portable Lamps and Their Applications*

By A. Cunnington, B.Sc.

IT is the intention in the present paper to summarise as briefly as possible the progress that has been made in portable lamps and to indicate the sort of resources an illuminating engineer has at the present time when dealing with jobs for which no lighting supply is available.

"Hang out your lamps"—the old-time cry of the watchman in the streets of London is a reminder that not so very long ago all lamps were portable. It is also a reminder that street lighting was left to the mercy of individual persons as well as individual lamps; but what I wish to stress at the moment is that until comparatively recent times lighting of every description had to be carried out by independent and generally portable units. Perhaps it would be stretching the meaning a little to describe as "portable" the enormous candelabra which used to figure in our old halls and palaces, but at least they were self-contained and could be moved from place to place, and we may take it as a fact that until the advent of gas, first supplied through pipes not much more than a century ago, all lamps, whether torches, candles, or oil burners, were of a portable self-contained type.

In looking through the volumes of ILLUMINATING ENGINEER during the early years of this society, one finds far more frequent reference to oil, petrol-gas, and acetylene lighting than is the case at the present day, and we need not look far for the reason. Twenty years ago there were very large areas of this country where no alternative to portable self-contained lamps existed. To-day the advent of the "grid" and consequent widespread development of electric supply on the one hand and the extensive linking up of gas companies with inter-connecting high-pressure mains on the other have led to a very different state of affairs. To illustrate the point, I may mention that twenty years ago, on the line between London and Bournemouth, there were thirteen stations not served by either gas or electric light. Now there are only four, and at two of these a gas supply is not far distant.

We may reasonably conclude that for what one may call general lighting portable lamps are becoming of less importance; but I need offer no apology for submitting these notes on lamps of this type, seeing that there are still many purposes for which lighting must necessarily be portable and self-contained. Let me instance a few of these, such as, e.g., miners' lamps, lighting for the protection of street works, for facilitating trench work in connection with cables or pipes, lamps for policemen or postmen, and the host of railway applications, such as guards', shunters' and carriage-examiners' lamps, etc., not to mention ordinary domestic lighting in the areas still unserved by public supply, and not forgetting the useful pocket electric lamp—that so-called "torch," beloved of schoolboys, which has taken the place of the candle and the hurricane lamp when we have to conduct nocturnal searches.

There has been a little difficulty in finding a short title that will cover the scope of the paper with reasonable accuracy. Some of the lamps I shall refer to may not be portable in a very literal sense—they are certainly not pocket lamps—but they are definitely transportable, and the feature they all have in common is that they are not connected to any supply cables or pipes. In attempting to classify these lamps it will be convenient to keep a rough chronological order. I shall hardly be expected to describe the ancient oil lamps of the Chaldeans or Egyptians, or to consider the time when certain wise virgins immortalised themselves by having their lamps filled and trimmed, but I would say in passing that some of the platelayers on the railway still cherish an unofficial affection for a weird and smoky flare which does not seem to differ very much from the Chaldean lamps displayed in the British Museum.

All the early portable lamps relied on paraffin or naphtha, the former being more respectable and available for interior use, whilst the naphtha flare, with its garish and flickering flame, is associated in our minds with fairs, open-air markets, and similar noisy functions. After the oil lamps came the acetylene flares, and these are still largely used for many purposes, but an important competitor with the acetylene flare has arisen in the latest type of vaporised oil lamp. I shall also have to refer to the domestic type of oil lamp with a mantle, in which paraffin burns through an ordinary wick, but the draught is so arranged as to produce a hot blue flame impinging on the mantle. Finally, one must not overlook the many kinds of portable electric lamps fitted with accumulators or dry batteries.

NAPHTHA AND PARAFFIN OIL FLARES.

Only brief reference need be made to these. Latterly the use of paraffin has replaced that of naphtha mainly because the former is less liable to give rise to explosion, but also because the preheating of the burner is easier with paraffin. The general arrangement of a typical burner is shown in Fig. 1.

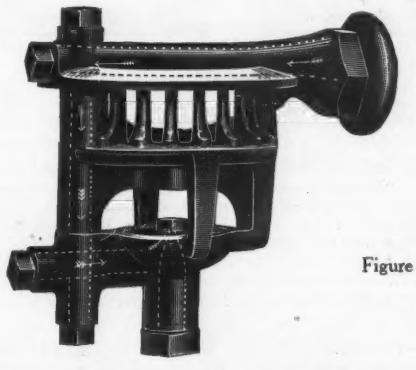


Figure 1.

The oil is carried to the minute hole in the central burner through passages which are pre-heated by burning waste or other simple means. As soon as the burner is hot enough, the oil issues as vapour, and burns with a white flame, which in its turn keeps the vaporising passages at the necessary temperature.

There is a further type of paraffin flare not dependent on a gravity feed from a container above the burner. In this case, the paraffin is stored in a welded steel cylindrical tank standing on the ground, with a strong tube carrying the burner above the tank. A small air pump or bicycle pump is used to create a sufficient pressure to force the paraffin up into the burner.

* Paper read at the meeting of the Illuminating Engineering Society, held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, at 6.30 p.m., on Tuesday, January 9th, 1934.

One is tempted to ask why these crude lamps are still in use, seeing that apparatus of much greater efficiency is available at reasonable cost. Doubtless the explanation lies in the extreme simplicity of the earlier types. There is nothing that can go wrong, and no small or fragile parts that soon require replacement. To anyone familiar with the rough-and-ready ways of the navvy, this extreme simplicity will be appreciated as a feature that is a decided set-off to the lesser efficiency of these oil flares.

ACETYLENE FLARES.

Although the well-known displacement principle of the common acetylene flare is so simple, it is by no means an easy matter to get satisfactory and steady production of gas from carbide, and most of the developments from the early types have been concerned with the control of the gas. One of the simplest forms of acetylene flare is shown diagrammatically in Fig. 2.

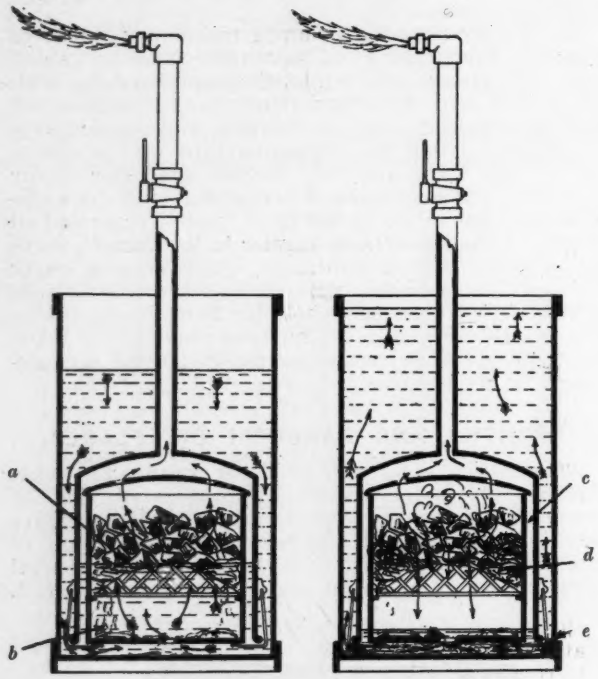


Figure 2.

The rising water attacking the carbide and generating acetylene. *Excess of acetylene generated, forcing the water off the carbide.*

(a) Very large surface of carbide exposed to the rising water causes irregular and excessive generation of acetylene. (b) Residue dropping to the bottom of the container gets washed out into the tank, coating the whole with lime slurry. (c) Owing to the space between the carbide container and bell, efficient cooling is prevented. (d) The drying carbide further encourages overheating. (e) Accumulation of residue at bottom of tank may cause dangerous pressure. This entails frequent washing out and refilling of tank.

The tap controlling the burner is kept closed until the outer vessel is filled with water. As soon as the tap is turned on, water rises into contact with carbide, and gas is generated. If the make of gas exceeds the rate at which the burner consumes it, the water is driven down and ceases to be in contact with the carbide, and the supply is immediately reduced.

If carbide always gave off gas uniformly, this system might work very well, but actually, due to the use of lump carbide and the crevices between the lumps, different portions of the carbide charge evolve gas at varying rates, and all methods of allowing water to drip on to carbide or to come into intermittent contact with it have the objection that the flow of gas tends to be spasmodic.

If any excess of gas is generated, and the contact of water with the carbide is interrupted, the heat generated quickly dries the residue, and when the water again tries to attack the carbide, it has first to re-wet the residue. This usually leads to the generation being too long delayed, and ultimately to the water reaching the carbide in too great a quantity, which causes over-generation, waste of gas, and possibly danger.

A type of acetylene flare lamp which has several advantages is shown in Fig. 3 and diagrammatically in Fig. 4.

Figure 3.

When the water valve F is turned to the " on " position, water runs on to the carbide and gas is generated. All excess of gas beyond that consumed at the burner flows into the accumulator space L displacing the water. As the water is forced out of the chamber L into the upper tank A, the head of water, and consequently the pressure of gas, is increased. This alteration in pressure is communicated through the water valve inlet pipe H to the water feed and first reduces the flow of the water on to the carbide, and if the generation of excess of gas persists, eventually completely cuts off the flow of water to the carbide, as is seen in the right-hand diagram.

To make this regulation very sensitive the device used is a valve consisting of a tube sliding over another tube, so that according to whether the tubes are loose or tight fit, the one on the other, the flow of water

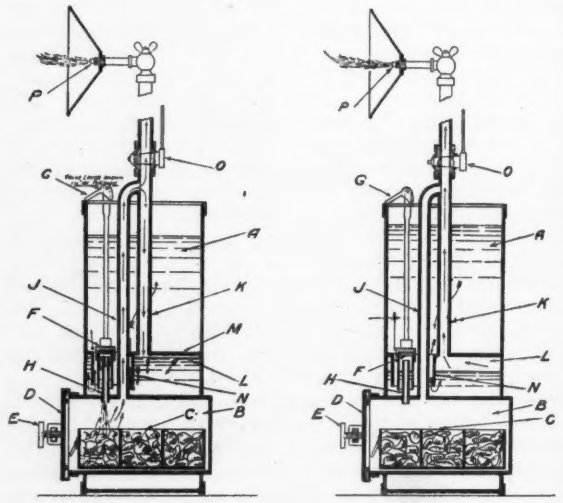


Figure 4.

will be varied. As a further refinement the tube is slotted so that the area through which water can flow increases gradually, and in some types a wick is used further to control the flow.

This scheme of control, which gives continuous generation, instead of generation in bursts, reduces overheating to such an extent that it has been found possible to make a generator taking a small charge ($3\frac{1}{2}$ lb.) in which air cooling is chiefly relied upon. This has made it possible to produce a lamp which is only 24 lb. in weight when fully charged, and will give a quite useful candle power for six hours.

There is not time to describe in detail the modifications in this type, but its general appearance is shown in Fig. 5, and it is undoubtedly a very useful form of portable lamp, really meriting the term " portable."

I ought to make passing reference to the type of acetylene flare using cake carbide. In this form the carbide is compressed into cylindrical cakes which can be readily stored and handled. For use in the flare lamps the carbide cakes are slipped into a form of metal basket, and the water is allowed to gain gradual access to the carbide as in the simple form of lamp first illustrated. As the carbide decomposes the sludge falls to the bottom and the fresh cake above gradually falls under its own weight and becomes consumed. This type of lamp is favoured on account of its simple manipulation.

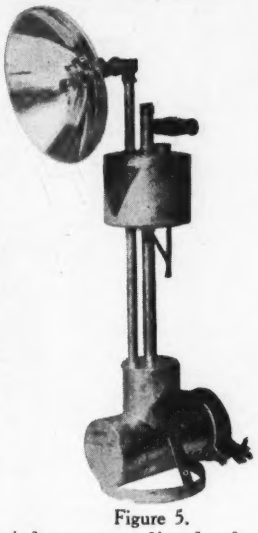


Figure 5.

Dissolved acetylene (i.e., acetylene gas dissolved under high pressure in acetone and thus sent out for use in cylinders, similar to other compressed gas cylinders) has been used for portable flare lamps, and these lamps may have been seen in our streets during dense London fogs. The general use of dissolved acetylene is, however, confined to large lamps suitable for buoys, aerodrome lights, etc., by no means portable, and I must not digress in these directions.

I can hardly do more than just mention the many forms of hand lamps, bicycle lamps, inspection lamps, etc., all depending on some form of drip feed for bringing the water progressively into contact with the carbide. Several of these are, however, available for inspection, and further reference will be made to them in dealing with applications.

VAPORISED PARAFFIN BURNERS.

As I have already indicated, the early forms of vaporised oil lamps, burning naphtha or paraffin, were somewhat crude. The necessary pre-heating of these flares was always troublesome, and the resultant flame had not any very great luminous efficiency, so it was not surprising that the advent of the incandescent mantle, used first with coal gas, directed attention to the possibility of producing a bunsen flame with vaporised paraffin and thus heating an incandescent mantle so as to produce the effect of a gas lamp without any pipe connections. The Kitson lamp employing an upright mantle was one of the earliest of these, which I remember seeing in use at the Paris Exhibition of 1900. Shortly after this the inverted incandescent mantle came into use for gas lighting, and the oil lamp makers then developed the Blanchard type of lamp which was the forerunner of the modern vaporised paraffin burner.

Two principal objections have been raised to this type of lamp:—

(1) The difficulty of correctly pre-heating the vaporiser.

(2) The tendency for the minute orifice in the burner to become clogged with carbon or other impurity.

Much ingenuity has been expended in overcoming these difficulties, and there is no doubt that the modern form of lamp is a thoroughly workable proposition so long as it is handled with reasonable intelligence.

The essential features of this modern vaporised paraffin lamp are shown in Fig. 6.

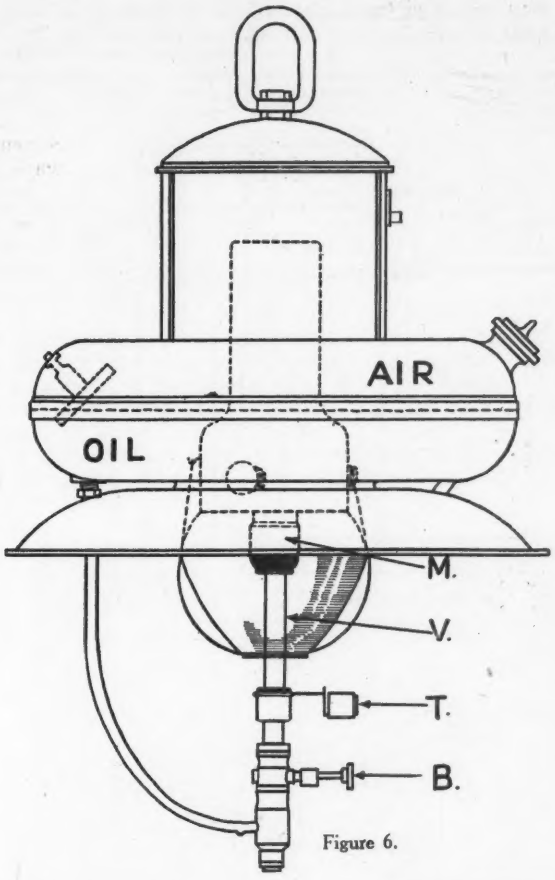


Figure 6.

Before turning on the valve B the vaporiser tube V is pre-heated by means of a methylated spirit torch temporarily clipped on. After three or four minutes the valve can be turned on and the air, which has been compressed in the upper part of the oil reservoir, forces the oil through the vaporiser tube, whence it issues as a gas and forms a high-pressure bunsen-flame round the mantle M. The latter is of silk in flexible form before being burned off, and is tied on to the nozzle of the burner, forming a robust fixing. The valve B is opened or closed by turning, and the action of turning the button also drives a cleaning wire into the fine hole of the burner when closing the valve. This ensures that the hole is always kept clean—a most important feature.

The oil containers are made of such capacity as to enable thirty-two burning hours to be obtained from a burner giving an exceptionally high candle-power. Some of the early lamps employed a separate bicycle pump for producing the air pressure, but the modern forms are all fitted with an air pump incorporated in the container.

The use of methylated spirit for pre-heating the vaporiser has been considered a drawback, as it involves the carrying of two kinds of spirit. This objection has been overcome in some patterns by the fitting of a self-filiing paraffin lighter. A further elaboration of this idea about to be developed is pre-heating by means of an aerated paraffin burner, in which the air pressure available in the containers is used to produce a hot flame, which makes the lighting of the lamp a much speedier operation.

One way to avoid trouble in the slow process of pre-heating an oil vapour lamp is to use a spirit which vaporises much more readily than paraffin, and this has led to the development of a petrol-vapour lamp similar in general style to the familiar hurricane lamp, but acting on the same principle as the lamp previously described, only with petrol instead of paraffin under air pressure in the container. The petrol is forced through a very simple vaporising tube to a nozzle carrying an inverted mantle.

The general arrangement of this form of lamp, which is exceptionally robust, is shown in Fig. 7.

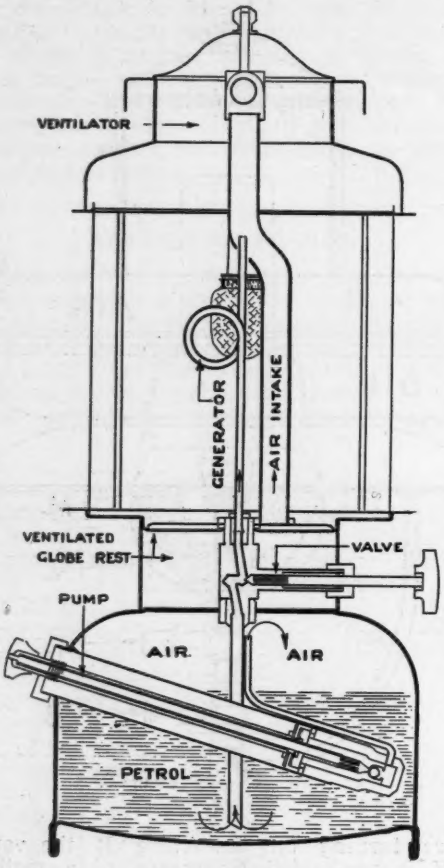


Figure 7.

The great feature of the petrol-vapour lamp is its quick lighting. The pre-heating of the vaporiser can be effected by heating with a taper, or even a couple of matches. Moreover, there is less tendency when using petrol for the passages of the vaporiser or the burner to get clogged with carbon. On the other hand, in this country at any rate, petrol is to be regarded as a somewhat costly fuel.

PARAFFIN LAMPS WITH INCANDESCENT MANTLES.

The lamps described in the previous section are of a highly efficient pattern, but it is obvious that pumping up air pressure and pre-heating the vaporiser are hindrances to their adoption by inexperienced users, and the hissing sound of the pressure burner might be considered a drawback for domestic use. There was therefore a clear field for an improvement on the time-honoured paraffin-wick lamp by making the burner capable of heating an incandescent mantle.

The essential points for ensuring a satisfactory blue flame from a paraffin-wick burner are: (1) that two currents of air, one from the outer periphery of the wick and the other from the inner side of the ring, shall converge at a point slightly above the top of the wick and (2) that the heat developed by the burner shall as far as possible be kept away from the wick tubes, which otherwise get so hot as to produce over-vaporisation.

The early forms of blue flame wick burners gave considerable trouble owing to the time taken in reaching a heat equilibrium and the tendency for over-vaporisation, with consequent deposit of unburned carbon on the mantle. The latest pattern of this burner has been designed with great ingenuity so as to overcome these objections and produce a really simple and robust mantle lamp.

The construction is shown diagrammatically in Fig. 8. Inner air is directed up the central air tube from

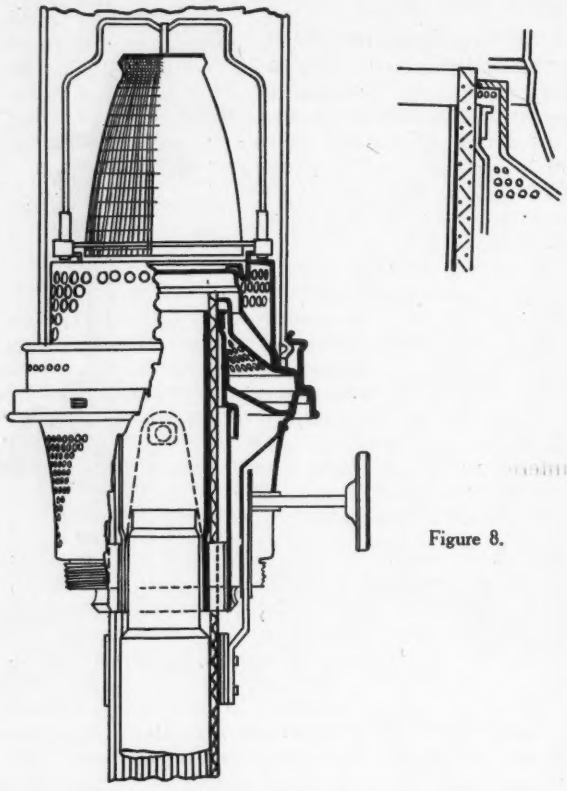


Figure 8.

the base of the lamp. Outer air is drawn in through the perforated external support and passes up through a special baffle, also perforated. This baffle performs a double function. It ensures that a small portion of the current of air shall be diverted inwards so as to cool the outer wick tube, and it also shields the base of the flame, making it possible for evaporation to take place at the exposed part of the wick instead of the portion held between the two tubes.

The provision of a large exposed area of the wick, which is shielded from air currents, makes it possible for the user to produce a large flame from the wick immediately upon the ignition of the fuel at the tip of the wick, and to obtain approximately a maximum light from the mantle at once. Eliminating the transfer of heat from burner elements to the wick tube makes the flame, thus quickly produced, stable in size and avoids the " creeping up " of the flame, and the usual resulting carbon deposits upon the incandescent mantle.

There are many other refinements of this modern oil lamp relating to the mantle and its support, etc., which cannot be dealt with in a brief description. A burner will, however, be available for inspection.

COMPARATIVE EFFICIENCIES.

It occurred to me that it would be of interest to estimate roughly the comparative efficiencies of the various lamps so far described, and a rough comparison is therefore set out in the accompanying table. I ought, perhaps, to apologise for inserting the column headed " Average Horizontal Candle Power " in these days of " Lumens," but I must plead the difficulty of obtaining the mean spherical candle-power of flare lamps which are not convenient things to place in a globe photometer.

Moreover, the illumination given by flare lamps is obviously of a very variable character, and therefore no comparative figures can be more than a rough guide.

PORTABLE LAMPS

Table of Comparative Efficiencies (Approx.)

TYPE OF LAMP	Fuel	Average Horizontal Candle-power	Consumption of fuel per hour	Cost per 1,000 candle-hours
Paraffin Flare	Paraffin	50	0·7 pint	1s. 2d.
Acetylene Flare	Carbide	80	0·6 lb.	1s. 3d.
Vaporised Paraffin (Incandescent Mantle)... ...	Paraffin	100	0·2 pint	2d.
Vaporised Petrol (Incandescent Mantle)	Petrol	40	0·1 pint	5d.
Paraffin Wick (Incandescent Mantle)	Paraffin	40	0·1 pint	2½d.

Assumed cost of Fuel: Paraffin—1d. per pint. Petrol—2d. per pint. Carbide—2d. per lb.

It is also most important to emphasise that the amount of candle-power obtained for a given expenditure in fuel is by no means a complete criterion of the value of the lamp, or even an accurate measure of its efficiency; strictly speaking, one should take into account the amount of labour expended in charging a lamp, the cost of renewing mantles, wicks, or burners and various other incidental expenses. Nevertheless, the table above is of some interest in showing how very cheaply candle-power can be obtained from vaporised oil lamps. The fact that the acetylene flare still holds its own is undoubtedly due to its extremely robust construction and absence of delicate parts.

BATTERY ELECTRIC LAMPS.

I can only make passing reference to portable battery lamps, but it is interesting to note some of the stages through which we have passed in progressing towards the ideal. First of all the pocket accumulator stage, followed by a reversion to dry batteries owing to the inherent difficulties experienced with small secondary batteries. Later, the demand for unspillable accumulators, particularly in connection with aircraft development and the recent extraordinary increase in facilities for battery charging arising from radio requirements. This has made the portable lamp with secondary battery quite a workable proposition, but notwithstanding this development the dry battery has by no means been pushed into the background, as confirmed by the enormous sale of " torches."

One of the principal difficulties with lamps depending on secondary batteries has been their poor performance when neglected, even for a short time. What a common experience it is to turn to a battery lamp and find that the cell, which was thought to be in good order, has become discharged. Much of this trouble can be avoided by the use of nickel-cadmium cells, and these are, I believe, employed fairly extensively, although their initial cost is somewhat high and the variation in voltage on discharge makes them unsuitable for purposes where constant candle-power is essential, as in some forms of portable photometer.

APPLICABILITY OF PORTABLE LAMPS.

It is obviously beyond the scope of a short paper to deal with many applications of portable lamps, and I propose to indicate only a few typical examples. Before doing so I should like to emphasise the great importance of knowing which of the many lamps available is the most suited for a particular job. This is where the illuminating engineer comes in, and it is for the purpose of summarising the information on the subject for the use of persons who may be called upon to decide for themselves or to advise others that papers of the kind now presented are prepared and can be justified.

An example of the need for discrimination between one lamp and another occurs in the application of acetylene flares and vaporised oil projector lamps for assisting night work on the railway. Although from a general utility point of view one might assume that these two forms of portable lamp are practically interchangeable, it is found from experience that the acetylene flare, with its extra robust construction, is on the whole more suitable for small jobs on the permanent way, where its position can readily be shifted and rough handling will not harm it, whereas the oil floodlight is particularly suited for the complete illumination of a section of the line such as is required when renewing points and crossings. In this case the lamp can be fixed on a low stage at the side of the track and trained on the work, being left in this position throughout the job. Fig. 9 gives some idea of the use of these two lamps in railway work.

Figure 9.

Again, a close comparison might be made between acetylene vaporised oil and electric inspection lamps, and having weighed up the pros and cons, such as facilities for battery charging or alternatively for obtaining and handling carbide or oil, we might arrive at the conclusion that these three types of lamp were equally applicable for all inspection purposes. But directly we took an acetylene lamp of the usual enclosed type into a tunnel for the purpose of searching for incipient cracks in the roof, we should find that we could not turn the beam vertically upwards without smoking or cracking the front glass. In other words, this kind of lamp is not suitable for the particular application, whereas the light source in an electric hand lamp or a small vaporised oil lamp would not be so barred. These simple and perhaps rather obvious examples drawn from railway experience are only typical of what would be found in other branches, and are distinct from the more general considerations of applicability, which should be—but alas are not always—clearly appreciated by lamp makers.

Simplicity and strength are obviously of the greatest importance for portable lamps, and these qualities may easily outweigh mere candle-power efficiency. One can never over-emphasise the point of view of the workman who has to use the lamp, not in the surroundings of the test-room but under conditions as they actually exist. It is noticeable that among some of the lamps described, those of rather poor actual efficiency are yet found to have their uses owing to the fact that they are absolutely devoid of anything that can go wrong. It is undoubtedly this fact that accounts for the continued use of oil lamps by guards and shunters, when electric and acetylene hand lamps of much higher candle-power are available.

On the other hand, for carriage-examiners' work, where there is no signal—which might be a matter of life or death—depending on the maintenance of the lamp, we find that acetylene hand-lamps are extensively used, and seem to give fairly satisfactory service.

EXAMPLES.

Until, roughly, thirty years ago no portable lamps were in general use having a luminous efficiency greater than crude oil and naphtha flares, but as already mentioned, the Paris Exhibition in 1900 saw the fairly extensive use of Kitson lamps, these being particularly useful for lighting at small cost the annexe to the main exhibition, situated in the Bois de Vincennes, at that time a park with no pipes or cables for artificial lighting.

In about 1910 we find acetylene flares (which had originated five or six years earlier) being used a good deal for building operations, enabling such works to be carried on during the night, and there was a note in THE ILLUMINATING ENGINEER at that time which is of some historical interest, in that it records the first application of flood-lighting to games. It showed the use of portable acetylene lamps arranged round a bowling green to enable an important match to be completed after dark.

I have already indicated the use of flares for general railway work. Fig. 10 shows a special application in which a small and light pattern is hooked on to the side of a waggon, thus being suitably placed for unloading goods or for discharging the ballast from the hoppers of ballast trains.

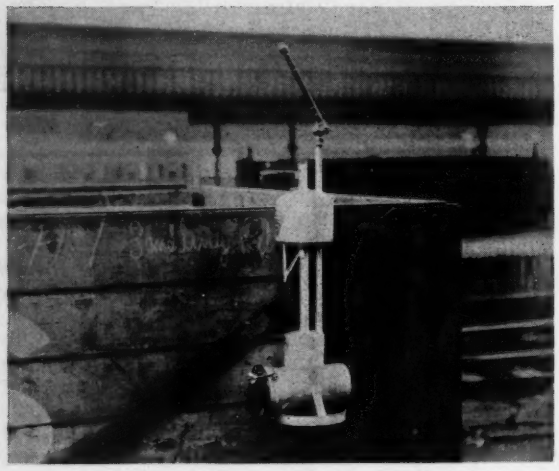


Figure 10.

Another example of the use of an acetylene flare is shown in Figs. 11 and 12. The large board is brightly lighted by the flare, the reflector of which screens the eye from glare. Red or green spots are illuminated by transmitted light at the centre of the reflector. There are, of course, many other street and traffic applications, but these hardly come under the heading of portable lamps.

Vaporised oil lamps with inverted mantles have become increasingly used in recent years, rapidly replacing the naphtha flare for open-air street markets, for stalls at fairs, and also for indoor use in shops and houses where something brighter than the ordinary paraffin lamp is required. The latest improvements in these lamps render them quite suitable for use on railways at stations and yards remote from public supplies, and, since the inherent difficulties in manipulation have now been largely overcome, they are now

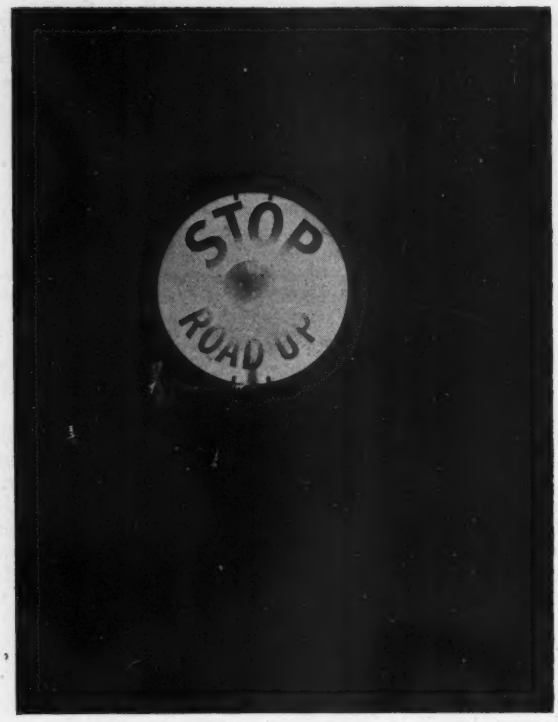


Figure 11.

Figure 12.

NOTE.

[Readers of this paper are cordially invited to write a brief account of any particular problem which they may have encountered in connection with any form of portable illuminant.

Letters which are considered to be of sufficient interest will be published in a forthcoming issue of the Journal, and should be addressed to the Editor and marked " PORTABLE."]

used extensively for many purposes on the railway. Fig. 13 shows platform lighting at a wayside station by vaporised oil lamps, fitted with special reflectors giving elongated distribution along an axis parallel with the platform edge.

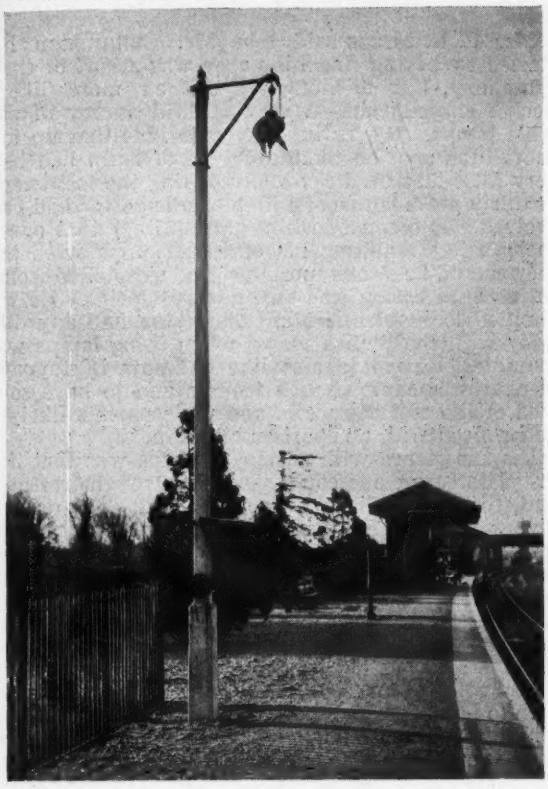


Figure 13.

Fig. 14 shows application of the vaporised oil floodlight to building works.

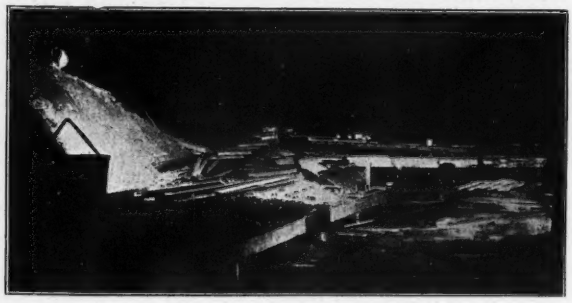


Figure 14.

The paraffin wick mantle burner is mainly to be regarded as a domestic lamp, but use is also made of this type on the railway for remote but important signal boxes and offices. It is hardly necessary to enumerate the various uses to which battery electric lamps are put; but I would direct your attention to some patterns which are available for inspection, including warehouse lamps for watchmen and a signalling lamp fitted with special Morse key, the latter type being used by the National Lifeboat Institution. You will note also a lamp attached to a band for fixing on the forehead, thus giving a light directed on to a job and yet leaving the hands entirely free.

Fig. 15 shows a battery lamp fitted up as a small portable floodlight, and Fig. 16 shows a special application of the nickel-cadmium battery to an emergency operating lamp for the hospital. It is obvious that for this duty a fairly high-capacity battery is required, and the special reliability of the nickel-cadmium cell renders it particularly

Figure 15.

suitable for a lamp used infrequently and often left standing for long periods.

In conclusion, I must express my thanks to the various firms who have assisted by contributing material for the paper, slides to illustrate it, and also in many

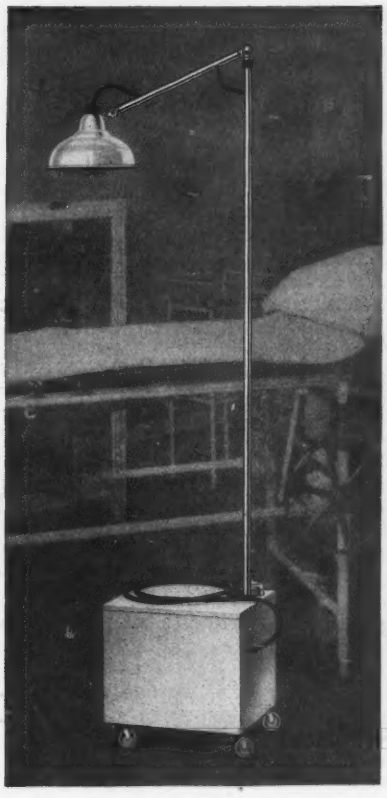


Figure 16.

cases actual examples of the lamps which I hope will be fully examined. These firms include Messrs. A. C. Wells, C. S. Milne, Carbic, Ltd., Tilley Lamp Co., Coleman Quicklite Co., Aladdin Industries, Ltd., The Nife Battery Co., Exide Battery Co., and The Ever Ready Company. I would add, also, my thanks to my assistants, and, in particular, to Mr. Golds, for the ready help given in tests and other detail work. I am very conscious of the scrappiness of the paper, which is hardly more than a collection of odd notes, but if it leads to a discussion in which we have the benefit of the experience of members in the various applications of portable lamps, it may have served a useful purpose.

DISCUSSION

Mr. W. A. WILLOX said he very much appreciated the invitation to attend the meeting and the honour conferred on him in opening the discussion. Some years ago he had been able to give up the use of portable lamps for carrying on nocturnal activities and now, in his present occupation, he relied entirely on fixed electric lights. He had, however, previously had much experience of night work on the Southern Railway. One of the early jobs he had undertaken was the relaying of a big junction on the South Coast. There they had two napthalene flares, a few " Chaldean " lamps, and a few fitful flares. Although there were nominally about forty men employed, not more than about thirty actually did useful work owing to the darkness, so that much time was lost and the cost of carrying out the job was unduly high. Endeavours were made to overcome the difficulty. First of all acetylene flares were substituted for the naphthalene ones. They had, however, met with difficulties usually experienced in introducing new things of getting the men to use them properly. After many experiments, and by degrees, the improved form of lamp described by Mr. Cunnington was evolved. Among the details which went to make for efficiency were the correct shape and position of the handle. The hook on the side of the lamp for hanging it on wagons was one of the most useful improvements. In the course of years such improvements in portable lamps had been made that work at night could now be carried out with almost as great efficiency as in daylight. He (Mr. Willox) did not wish to claim credit for these improvements, but he had just quoted his experience to show how things " grew up " and how the user in co-operation with the manufacturer contributed to the task of developing something really useful. He knew that the illuminating engineer had made progress parallel to the other applications of science, but he had by no means reached finality. It was, however, only necessary to consider the growth in recent years to realise the debt the public owed to these engineers for the very material progress that had been made.

Mr. A. H. STEVENS said that Mr. Dow had asked him to say a few words, but he had told him that he did not think it would be necessary to add anything to the paper. Mr. Dow, however, asked him to go over the paper microscopically, and this he had done.

He wished to thank Mr. Cunnington for a most interesting paper. He would, however, like to put one or two questions to him. He considered that acetylene lamps formed one of the most suitable type of portable lamps, but the large ones were certainly not easy to carry about. He referred to the dreadful fog we had recently, and the unfortunate mishap which occurred on the L.M.S. Railway on that occasion, and mentioned the usefulness of the portable lamp at that time. He would like to know if anyone could invent a portable lamp that could be worn on the cap of the worker. This would be most useful, as the man could then have both his hands free for his job, but it would of necessity have to be of a very light construction.

Mr. Stevens remarked upon the beautiful appearance of the lamps that Mr. Cunnington had shown, and wondered if they would be in the same condition after three months' use on the railway. Unfortunately one had to deal with the human element in this respect, and it was within his knowledge that the staff at one station would make a success of a lamp, but at another station it would be a complete failure, entirely due to the fact that the staff handled it wrongly.

He wondered whether Mr. Cunnington had found any difficulty in using the non-pressure incandescent mantle oil lamp at any particular place; he had found it rather sensitive to draught, and, therefore, could not be generally used.

Mr. Stevens asked whether anyone could suggest a good portable lamp for use by the men cleaning engine boiler tubes; it was very desirable the engine-cleaners should have good lighting to enable the examinations of the locomotive to be kept up to a high standard.

Mr. C. S. MILNE said that Mr. Cunnington had started by saying that his paper was a sort of small symphony, but he thought it seemed more like a pocket encyclopedia—a very faithful survey of portable lamps. It was interesting to note that up to a short time ago the Chaldean type of lamp had been very little improved upon, but during the last twenty or thirty years lamps of a high candle-power had been evolved. It seemed to him (Mr. Milne) that one of the greatest requirements of these lamps were that they should be strong, portable, and simple. Absolute certainty of action was an important point. He was tempted to inquire if Mr. Cunnington had any difficulty with the British navvy when using lamps with mantles. He would also like to know if stoppages of apertures caused much trouble and to have some idea of the cost of repairs and replacements likely to be involved with a vaporised oil lamp.

His experience with acetylene lamps was that they lasted for ever; one could give them rough treatment and, like old soldiers, they never died! The original diving bell type, however, could not stand rough treatment, as the water rushed into the carbide when the lamp was tipped over. This might be dangerous if any other lighted lamps were nearby; but with the types shown by Mr. Cunnington there was not any chance of water flooding the carbide quickly and therefore there was no danger from the lamp being upset.

Mr. Stevens mentioned the difficulty in getting the men to handle the lamps properly. One reason he felt why the Southern Railway obtained such excellent results was that they co-operated with the manufacturer and so secured just the lamp that suited their particular purpose. They also got the manufacturers interested so that they were always willing to go down and help the men when they got into difficulties. Other railway companies might perhaps with advantage follow their example.

Mr. Milne also referred to fuel costs. In this the acetylene lamp showed up rather badly, but one must take into account the fact that it was wind proof and that large candle-power lamps did not need glass protection in the way lamps using mantles naturally did. In regard to tunnel work Mr. Cunnington had mentioned that acetylene hand lamps were unsuitable for inspection work. The high candle-power type, however, could be turned to throw a beam in any desired direction and were useful for tunnel and bridge repairs, though too large for inspection work.

Mr. Milne concluded by saying that he would like, as a manufacturer, to thank Mr. Cunnington for all the help he had given them in developing a light and portable lamp suitable for railway work, and he also wished to say how much he had enjoyed Mr. Cunnington's paper.

Mr. H. LONG congratulated Mr. Cunnington on having brought to the notice of the meeting all these portable devices and types of lamps, many of which were not very familiar to the illuminating engineer, who heard much about technical data but did not often have a chance of hearing a paper dealing with things so practical and interesting as those shown at this meeting. He himself had had little experience with portable lamps of this kind. He was, however, familiar with portable hand-lamps connected to electric supply, and gave particulars of a special model of reinforced bakelite construction, the production of which he was concerned with in conjunction with one of the railway companies. Mr. Long mentioned his appreciation of the way in which railway engineers co-operated with manufacturers in the development of

equipment especially suitable to the arduous service for railway operations. It was as a result of this co-operation that this particular hand-lamp was developed, and whereas the consumption of hand-lamps had previously been alarmingly high, due to their not being sufficiently robust for the service, the new model had entirely eliminated this trouble. He thought that Mr. Cunnington's paper had shown how useful the experience of railway companies' engineers would often be to the manufacturers producing for this class of service.

Mr. J. R. HEPPLE said he would like to add his praise to Mr. Cunnington. He had only one question to ask. Had Mr. Cunnington ever considered the possibility of using compressed gas in cylinders for portable lighting where a supply of gas was not available?

Mr. A. BARRETT said that although some of the portable paraffin vapour-burning lamps might appear fragile, they were really much more robust than might be imagined, as their rapidly increasing use by initially sceptical contractors, etc.,would testify. The fragility of the mantle and the trouble caused by the use of fine orifices had been cited against this type of lamp, but perhaps Mr. Cunnington would confirm how these troubles had been overcome. The mantle, owing to its special weave and material, together with the important fact of being supported top and bottom, was robust enough to withstand a surprising amount of rough usage. Many examples of this could be given, of which an amusing one was seen when a navvy, climbing out of a road excavation with one of these lamps, slipped. The lamp, jerked from his grasp, finished up in the gutter on the other side of the road. When picked up, the lamp was still burning and the mantle intact! The early difficulties of choked nipple orifices were due to corrosion and foreign matter finding its way into the small hole. The former difficulty had been completely overcome by the use of correct materials, whilst the provision of a self-cleaning device enabled the hole to be pricked clean, without extinguishing the lamp, by the turn of a button. The necessity for pricking out was rare and was principally due to the use of dirty oil. A special fabric filter was incorporated in the lamp, however, to provide against this.

Mr. J. S. Dow said that Mr. Cunnington had covered the ground very fully. He had, however, found one or two topics on which something further might be said. Mr. Cunnington had described the various forms of torches, but he did not mention one form—the torch which had inside, instead of a battery, a small generator, driven by pressure of the thumb. This torch had the great advantage in that it ought to be always in good order, even if only needed occasionally.

There was another form of lighting which Mr. Cunnington had not mentioned, though he (Mr. Dow) knew that he was aware of it. This device depended on the use of the hot flame formed by combining oxygen and some hydrocarbon gas, which impinged on a pastille of rare earths, giving a bright incandescent source of small area. It did seem just possible that a small concentrating light of this kind, which would give a confined beam like a searchlight, might have special applications. Incidentally, this device was said to have " good penetrating power in fog "—a claim made for many illuminants. He did not know whether Mr. Cunnington would care to express any views in regard to the form of lighting most useful in foggy weather.

In conclusion, Mr. Dow recalled the recent disastrous railway accident in France, which occurred during fog. It had been suggested that possibly a powerful light at the rear of the train would have served as a warning and at least diminished the impact of collision. If some of the lamps shown that evening were, as a precaution, carried in the guard's van, and if red screens were also kept, a sufficient blaze of light might be improvised to make the presence of the train evident, even in quite a dense fog.

Mr. P. S. BARTON said the mention of the portable generator reminded him of the one he had a long time ago on a bicycle. He was held up by a traffic policeman at a busy cross-roads. The officer noticed that the lamp was not alight, due to the bicycle being stationary, and commented upon this fact, but laughingly remarked that he could take no action, since the law laid down that bicycles being ridden on the highway must carry a light, and this one was not being ridden at that precise moment.

Mr. Barton further commented upon a form of portable lamp, which was possibly outside the scope of this paper, viz., the stand and bracket commonly used in garages. These had the disadvantage of the lamp and small vitreous enamelled reflector part getting very dirty through constant handling, and so becoming extremely inefficient. An improvement adopted by a firm of motor-car builders consisted of a number of specular reflectors with glass fronts standing a little distance away. With similar wattage the light was considerably better, and the lamps were well out of the way of the mechanics.

Mr. THOS TERRELL (*communicated*) :—

It is not clear to me how Mr. Cunnington arrived at the figures given for incandescent mantle wick lamps in his table of comparative efficiencies. The standard lamp in which the writer is interested has a m.s.c.p. of between 75 and 90 taken on a standard grease spot photometer, and the consumption of fuel per hour should be approximately 0.12 pints. I can only assume that the wick was not properly turned up when Mr. Cunnington conducted his tests.

Then, again, Mr. Cunnington assumed the cost of fuel (paraffin) at 1d. per pint. There are not many places in this country where paraffin can be purchased retail at this figure, and certainly in the majority of cases where it was possible the oil would be very unsuitable for lamps of either the wick or pressure type. My company have suffered considerably from the introduction of inferior oils, and have been forced, in the interest of their goods, to arrange for the marketing of a branded guaranteed oil. First-grade paraffins should retail at anything between 10d. and 1s. 1d. per gallon, depending upon the locality.

It is rather interesting to note that paraffin wick mantle lamps are now finding an extensive use on the Continent for lighting shore and groyne lighthouses of low calibre. They are placed in wind-proof towers, and it has been found possible to make them burn for periods as long as three days without attention.

So far as England is concerned, the wick mantle lamp has to a large extent superseded the pressure type of apparatus, doubtlessly due to the ease of lighting and the absence of noise, which is always present when gas has to be forced through a nipple under pressure. In tropical countries, however, the pressure lamp holds it own, as it is proof against the draughts of punkahs and the like.

The outdoor pressure lamp is still largely used for outdoor lighting.

The poultry industry is now providing a considerable market for incandescent lamps for use in poultry houses and the like, where winter days are artificially lengthened so that the birds may continue feeding and scratching for longer periods. This treatment has been found very beneficial to egg production during the winter.

Mr. R. Tandy (*communicated*) :—

The paper is most interesting, but I think the title of the paper should have been "Self-contained Lamps." When speaking of portable lamps one thinks of something one can carry about easily—not lamps of 100 c.p., which almost need to be carried about in a hand-cart.

Mr. Cunnington does not devote much space to elec-

tric portable lamps. I think a lot more could have been said about miners' lamps and police lamps.

I do not know if portable lamps with their supply taken off the mains should come into this paper, but from a railway point of view I consider this very important, especially the lighting of the interior of goods vans, which is a most difficult problem to do cheaply and efficiently.

Mr. A. CUNNINGTON, in reply, said he was very glad that Mr. Willox had been able to attend and tell of some of his experience. Mr. Stevens had put one or two questions. He had referred to the fact that acetylene flares were of a rather heavy nature. Mr. Stevens probably had in mind the high candle-power acetylene flares, which were hardly portable in the sense that they required two men to carry. The smaller type, however, gave quite a useful candle-power, and could be managed by one man without difficulty, though naturally he might be aggrieved if asked to carry one half a mile or so. Mr. Stevens had also asked about portable forehead lights. These were helpful, and quite good, but should be very light. Dry batteries would be no good, but the modern unspillable cells might quite possibly be applied. Battery lamps had been tried on the Great Western Railway many years ago. He had endeavoured to find out the results of these trials, but so far without success, though he believed that they were given up owing to the difficulty of maintaining and charging the batteries. Such lamps had been used in the past by ticket collectors, but a good deal of trouble was involved in charging the batteries. Possibly dry batteries would be better if they could be made to last longer. Mr. Stevens had also asked about the condition of new lamps after three months' wear. Did they still look so beautiful? His answer was most emphatically No! This applied not merely to portable lamps, but to most fittings on railways, the condition of which depended so much upon maintenance. He (Mr. Cunnington) found it frequently necessary to emphasise the vital importance of devices intended for use on railways being easy to maintain.

He had had the same experiences as Mr. Stevens in finding that one man could make a lamp work quite well, whereas another made a hash of it. This depended on the man. There was one point he would like to emphasise, however. There was really very little that could go wrong with the modern lamps described. In regard to lamps for the inspection of boiler tubes, a small electric lamp at the end of a rod had been tried and found fairly successful, but was apt to get out of order quickly because of the difficulty of the flex getting frayed. If used carefully, they might be successful, but the problem was rather a difficult one.

Mr. Milne had referred to the importance of certainty of action of the lamps. Doubtless one of the features of the acetylene flare was that it could be knocked about and kept under adverse conditions and one still got results out of it. Modern Vaporised Oil lamps with mantles were also being improved and made more robust so that they could be used under severe conditions. The task of preparing and cleaning the lamps should not, however, be left to a navvy, but should be done by a trained lamp-man. The latest types of acetylene flare were much safer than the earlier forms. Acetylene inspection lamps were very generally useful. These were used for all sorts of purposes and on the Southern Railway especially by carriage examiners, but vaporised oil hand lamps were becoming equally satisfactory, and could be dumped about anywhere.

Mr. Long referred to a lamp made of reinforced Bakelite. Undoubtedly this would be an important asset and should be much used in the future. Reference had been made to the use of compressed gas in cylinders. He had had no experience of this form of light, but there seemed no reason why it should not be used, provided such difficulties as charging and the provision of spares could be met.

Mr. Barratt had emphasised the robust nature of the vaporised oil lamps. These lamps were not really delicate and could stand any ordinary usage. He was glad that Mr. Barratt had emphasised the self-cleaning device.

Mr. Dow referred to the generating torch. He knew this quite well as he had one at home—it never failed. On the other hand it could be only used for intermittent action, as it was too fatiguing to operate by hand for long. He had often wondered whether one could not adopt a generator of this kind with a clockwork mechanism. As regards the use of an Oxy-Acetylene flame on pastilles of rare earth he agreed that it might be useful for certain purposes, but he thought that the majority of purposes for which beams were required involved fairly wide spread of light rather than a very concentrated beam. As regards the value of these in fog he could not say anything authoritatively. He thought, however, that there was very little to choose between illuminants in this respect, and that visibility at a distance was largely a question of candle-power. If one had a lamp of very high candle-power it would, of course, penetrate almost anything. The use of portable lamps placed in the rear of trains in emergencies seemed a good idea provided it did not conflict with the regulation practice on the railways regarding tail lamps.

The design of lamps for bicycles was an interesting problem but hardly came within the scope of this paper. Mr. Cunnington hoped that those present would take the opportunity of examining the lamps.

Added:

In reply to the communicated remarks, I must point out to Mr. Terrell that the candle-power readings were all taken in a horizontal direction only, and this would largely account for the discrepancy between the figures. As, however, the consumption of oil was 0.10 pint per hour, as compared with 0.12 pint per hour, given by Mr. Terrell it may be that the flame was not adjusted to its absolute maximum of candle-power. The paraffin used was of ordinary grade as used on the railway, and not as specially supplied for use with these lamps. This may have further reduced the candle-power slightly, but would not affect materially the efficiency figure, which I am satisfied is a fair one for working—not laboratory—conditions. Regarding the quality and price of the fuel, we are able on the railway to purchase satisfactory paraffin at the price given, but I quite agree with Mr. Terrell that a high-grade paraffin is essential, and no attempt should be made to practice false economy by buying cheap but inferior fuel.

I regret that I could not devote more time to electric portable lamps, but I must plead that the ordinary types are well known, whilst a special application such as miners' lamps would require a whole paper to itself.

Association of Public Lighting Engineers

Exhibition of Public Lamps and Lighting Equipment in Aberdeen

At a meeting of exhibitors held in the lecture theatre of Holophane, Ltd. (Elverton Street, Westminster), on February 14, it was decided to arrange an Exhibition of Public Lamps and Lighting Equipment in connection with the Eleventh Annual Conference of the Association of Public Lighting Engineers, to be held in Aberdeen during September 17 to 20. We understand that practically all the available space was allotted. Mr. Alex Forbes, Public Lighting Engineer to Aberdeen, who came down to London specially to attend the meeting, assured those present of a cordial welcome.

The Illuminating Engineering Society Annual Dinner

(Held at the Trocadero Restaurant, Piccadilly Circus, London, W.C., at 7.30 p.m., on Tuesday, February 13th, 1934, on the occasion of the Twenty-Fifth Anniversary of the founding of the Society.)

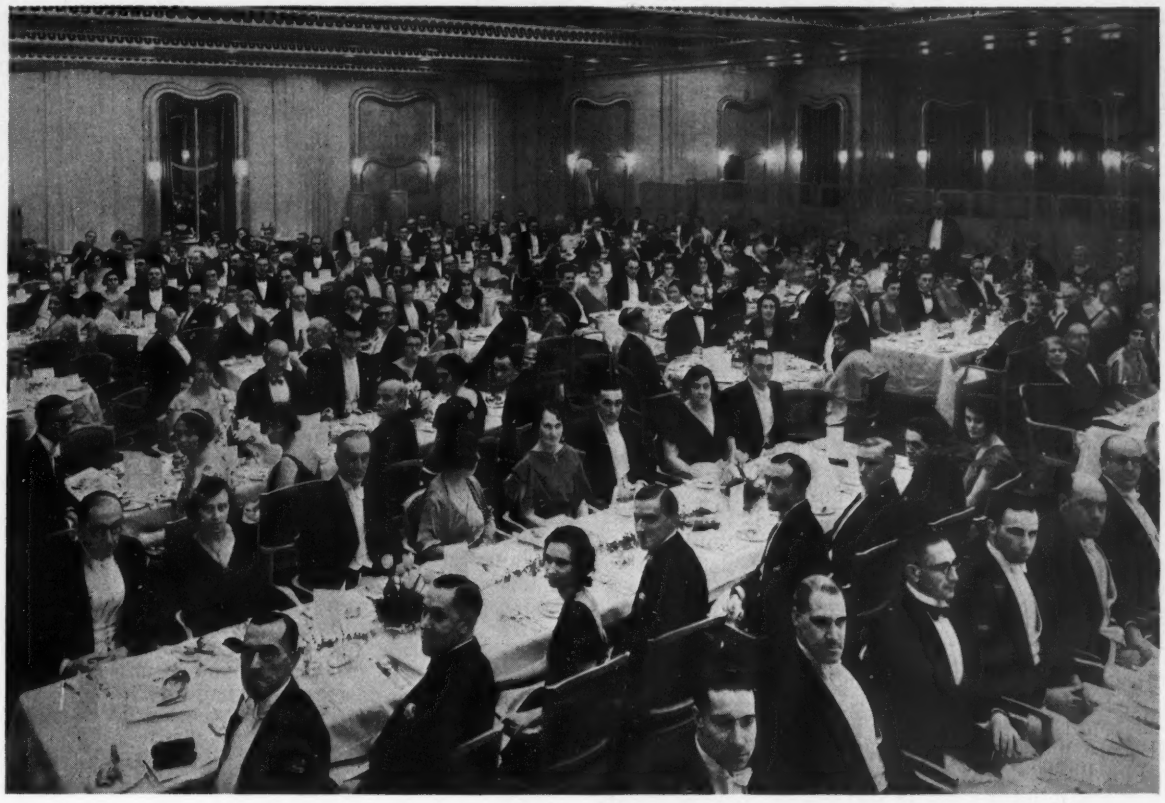


Photo. by Rawood, Ltd.

The above photograph was taken during the Dinner without the aid of flashlight. In the background the President (Mr. C. W. Sully) is seen standing. Mr. Henry W. Archer is on his right. Further on are Sir John Herbert Parsons, Mr. D. R. Wilson, Sir David and Lady Munro, and Mr. and Mrs. Severn. On the left are Sir Henry Lyons, Mr. P. V. Hunter, Mrs. Sully, Lt.-Col. Kenelm Edgcumbe, Mr. Maurice E. Webb, Sir Frank E. Smith, and others.

THE annual dinner of the Illuminating Engineering Society, which took place at the Trocadero Restaurant (Piccadilly Circus) on Tuesday, February 13, coincided almost exactly with the twenty-fifth anniversary of the date of the foundation of the Society. It was on Tuesday, February 9, 1909, that it was determined, in the course of an informal dinner held at the Criterion Restaurant, to form the Society. Of these original " foundation members " five were present at the dinner held twenty-five years later—Mr. J. S. Dow, Mr. J. Eck, Lt.-Col. Kenelm Edgcumbe, Sir John Herbert Parsons, and Mr. H. C. Wheat.

The dinner was, as usual, a most enjoyable event, well worthy of the occasion. One becomes tired of saying at each successive dinner that the attendance has increased; but, in fact, the number present (234 by the table plan) was again a record. The forecast made last year—that it might be necessary to " cross the Rubicon," i.e., to extend the tables beyond the famous " lifting wall " in the Empire Room—was fulfilled.

The President (Mr. C. W. Sully) and Mrs. Sully received the guests. As usual, gas and electric lighting were both well represented. Amongst those present, in addition to those named above, may be mentioned: Mr. Henry W. Archer (Editor of the " Manchester Evening News "), Mr. A. W. Beuttell (Vice-President), Mr. A. Cunnington (Vice-President), Mr. R. S. Downe and Mrs. Downe, Lt. C. H. Silvester Evans and Mrs. Evans, Miss C. Haslett (Director of the Electrical Association for Women), Dr. Sybil Horner, Mr. P. V. Hunter (President of the Institution of Electrical Engineers) and Miss Hunter, Mr. W. J. Jones and Mrs. Jones, Mr. Stephen Lacey and Mrs. Lacey, Sir Henry Lyons (Vice-President and Treasurer of the Royal Society), Mr. C. A. Masterman and Mrs. Masterman, Sir David Munro (Secretary of the Industrial Health Research Board) and Lady Munro, Mr. F. W. Purse, Mrs. F. W. Purse, and Miss Purse, Mr. W. L. Randall and Mrs. Randall, Mr. J. D. K. Restler (President of the Association of Engineers in Charge) and Mrs. Restler, Mr. T. Richbell, Mr. T. E. Ritchie and Mrs. Ritchie, Mr. Howard Robertson, Mr. James Sellars, Mr. E. M. Severn (President of the Association of Public Lighting Engineers) and Mrs. Severn, Sir Frank Smith (Secretary of the Department of Scientific and Industrial Research) and Miss Smith, Mr. L. J. Veit and Mrs. Veit, Lt.-Col. W. A. Vignoles and Mrs. Vignoles, Mr. Maurice E. Webb (Vice-President of the Royal Institute of British Architects), Mr. T. Wilkie and Mrs. Wilkie, Mr. D. R. Wilson (H.M. Chief Inspector of Factories, Past President), Mr. G. H. Wilson, Mr. C. I. Winstone and Mrs. Winstone, Mr. H. T. Young and Mrs. Young.

Amongst the very few who were, at the last minute, prevented from being present, and who conveyed their

respects, was Mr. F. P. Tarrat (President of the Institution of Gas Engineers).

A MESSAGE FROM THE UNITED STATES.

A very pleasing recognition of the occasion was afforded by the letter received from the Illuminating Engineering Society in the United States, conveying good wishes for the future prosperity of the Society, which was read out; a congratulatory telegram addressed to the President by the Chairman of the Electric Lamp Manufacturers Association was also announced.

"THE ILLUMINATING ENGINEERING SOCIETY."

The usual loyal toast having been honoured, the toast of "The Illuminating Engineering Society" was proposed by MR. HENRY W. ARCHER (Editor of the "Manchester Evening News"), who commented on the educational work of the Society. This, he said, ought to win universal approbation. He hoped that some who had delayed the work of the Society were now beginning to see the light. It was perplexing to realise that although light travels at the rate of 11 million miles a minute there were still dark recesses where it had not arrived. But when it was recalled—as Sir James Jeans and other astronomers had taught us—that the light from distant stars had taken anything from 18,000 to 140,000,000 years to reach us, it would be seen that there was still ground for hope!

Great changes had taken place in methods of lighting since Victorian days. Mr. Archer observed that modern science had made it possible to burn the candle at both ends and fit a power plug in the middle! Nothing marked the quickening pace of human progress more clearly than the changes effected by the development of artificial lighting since the birth of the Society. Miracles of light transformation had been performed in homes, factories, theatres, and cinemas. But there was still scope for the exercise of more inventive genius. The need common to the dying philosopher and the leaping pedestrian who had no desire to die could still be expressed in the cry for more and still more light. When the Broad Highway became the Floodlit Highway we should be in sight of safety first at last. But we should still be far from the Wellsian dream of luminous roads.

Mr. Archer recalled the floodlighting demonstrations in 1931. He remarked that all the great men upon whom the light was then directed were dead ones! He had sufficient faith to believe that what had been done for the dead would eventually be done for the living, and that the brighter homes of their creation would be inhabited by men and women with brighter minds.

MR. C. W. SULLY (*President*), in responding, recalled that the Society had been in existence for a full quarter of a century—almost to a day. In a sense—if one considered the enforced darkness of the four years of the Great War—they might regard this present year as the one in which the Society had attained its majority.

The work of the Society differed from that of many kindred bodies in that illumination had always been one of the fundamental necessities of mankind. Light, like food, had always been essential to the very existence of the human race. (Our records of "In the beginning" definitely indicated that "light" had preference over "food," which latter was first mentioned when reference was made to "the apple.")

John Stuart Mill had said "there is not a more accurate test of the progress of civilisation than the progress of the power of co-operation." This Society aimed at drawing together those who had in the Pauline phrase "diversity of gifts but the same spirit." In order to carry this into effect the members had been drawn from two competing industries which, twenty-five years ago, were developing the use of artificial light by their own particular methods. The Society had enabled these two industries to keep in contact and to realise that, in the study of illumination, whatever might be of assistance to the one must also benefit the other. The advantages gained through this phase of the Society's membership were very noticeable during the holding in this country, in 1931, of the International Illumination Congress.

Furthermore, as the activities of the Society affected the customs, habits, and health of the whole nation, the Society wished to co-operate with all who were in any way interested in the subject of light, in order that their work might be disseminated throughout the country. Possibly some who were keenly interested in the practical application of light might regard the Society as too technical for their taste. This, however, was a mistake. The work was too wide in scope to be limited by this consideration.

Special efforts were now being made to extend its membership by means of meetings in such cities as Glasgow, Liverpool, and Manchester. On the 22nd of the present month a special conference was being held at the British Industries Fair, Birmingham, when they hoped to meet many who were actively engaged in illumination and were domiciled in the provinces. Arrangements had recently been made for a new class of membership, that of "affiliated students," in order that the future generation, whilst engaged in their studies, might have the opportunity of joining the Society.

In such ways members of the Society hoped to be of service to their fellow-men, and he invited the various societies, whose representatives were present as their guests, to assist them in all these efforts.

THE GUESTS.

MR. PERCY GOOD (Hon. Treasurer), in proposing this toast, explained that he did so in the enforced absence of the senior Vice-President. He recalled the reference of previous speakers to the function of the Society in furnishing a common meeting-place for those associated with gas and electric lighting, and humorously pictured an extension of the "grid" in the form of underground triple-concentric main system, facilitating the simultaneous flow of gas and electricity and water.

Mr. Good remarked that this was a birthday occasion. It was fitting, therefore, that they should ask their guests to share in their celebration. They did so because these guests were their valued friends. Many of them were known to him personally. He did not mean to dilate on the work of the Society, but he would like to say that he was proud of this work and of those who were doing it.

On looking down the list of names of those at the high table they would see how very representative it was and how many kindred institutions were included. The cordial relationship with these various bodies was one that the Society valued very highly. He hoped that they would all have a most enjoyable evening. He could not enumerate all those who were present, but he would like to mention the Mr. Maurice Webb who represented the Royal Institute of British Architects, a distinguished architect who had filled many honourable posts, and whose name was coupled with the toast.

MR. MAURICE E. WEBB (Vice-President of the Royal Institute of British Architects), briefly responding to the toast, expressed his pleasure in being present and his interest in the work of the Society. In humorous vein he contrasted illuminating engineering with the sun, in their relative effect on the appearance of buildings. He mentioned especially the influence of floodlighting, which usually came from below, whereas daylight was received from above, and, therefore, had a distorting effect on the appearance of architecture—in some cases showing up defects which would otherwise escape notice.

The remainder of the evening was, as usual, devoted to dancing and social intercourse, a new and much appreciated item on this occasion being the presence of Mr. John Tilley, the well-known entertainer, who delighted those present by his characteristic burlesques.

Literature on Lighting*

(Abstracts of recent articles on Illumination and Photometry in the Technical Press)

(*Continued from page 49, February, 1934*)

I.—RADIATION AND GENERAL PHYSICS.

40. The Physical Basis of the Production of Light, with Particular Reference to the Gas Discharge. R. Rompe.

Licht u. Lampe 23, *p*, 27, *January* 8, 1934.

A general review of the interatomic processes of gas discharge. E. S. B.-S.

II.—PHOTOMETRY.

41. A Simple Microphotometer. H. v. Oemeke.

Zeits. f. Techn. Physik, 15, 2, *p.* 72, 1934.

Describes a comparatively simple photometer using a Speirschicht Cell. Several photographs are given. W. R. S.

42. A Source of Error in Photometry. A. Langseth, E. Walles.

Nature, *Vol.* 133, *No.* 3,354, *p.* 210, *February* 10, 1934.

Discusses an error liable to occur in the microphotometry of spectral lines, originating in the width of slit employed in the photometer. J. M. W.

43. The Photronic Type Photoelectric Cell. R. Higonnet.

R.G.E., 35, *pp.* 125-129, *January* 27, 1934.

The author describes the characteristics of the "photronic" type of photocell, and discusses its application to illumination measurements. He then proceeds to discuss other applications of the cell, principally as that of a light-controlled relay for controlling lighting of streets, airports, etc., and for other commercial purposes. W. C. M. W.

44. Graphical Methods for Tracing Curves of Equal Illumination. R. Nampon.

R.G.E., 34, *pp.* 791-795, *December* 9, 1933.

A method is put forward whereby isolux curves may be obtained from iso-candle curves for street lighting fittings by graphical construction. The case of a fitting whose axis is not vertical is also considered. W. C. M. W.

III.—SOURCES OF LIGHT.

45. Daylight Gas Discharge Lamp. Anon.

El. Times, 85, *p.* 177, *February* 8, 1934.

An objection raised against the high-pressure mercury vapour discharge lamp is the incorrect rendering of colours. This is due to a deficiency in red light emitted by the source. In the lamp described in this article some correction has been made for this defect. W. R. S.

46. Luminous Discharge Lamps. C. C. Paterson.

Elect., 112, *pp.* 104-105, *January* 26, 1934.

A summary is given of recent progress in construction, improvements in characteristics, and utilisation of luminous discharge lamps. Two photographs of street-lighting installations are included. C. A. M.

47. The Efficient Production of Light. S. Danesi.

L'Illuminazione Razionale, *pp.* 245-251, *November*, 1933.

A summary of an address analysing the principles of light production from incandescent solids and luminous gases and vapours, and describing forms of electric discharge lamps. J. S. D.

48. New Photoflash Lamp. H. G. Schiller.

Light, 3, *p.* 31, *End of Year*, 1933.

A new photoflash lamp, about the size of a 300-watt general service lamp, is now available in America. C. A. M.

IV.—LIGHTING EQUIPMENT.

49. Illuminating Glassware Production. J. H. Northwood.

El. Review, *Vol. cxiv.*, *No.* 2,933, *p.* 185, *February* 9, 1934.

Describes the production of hand-blown illuminating glassware. J. M. W.

50. The Tracing of Ray Paths in Illuminating Glassware. J. M. Waldram.

G.E.C. Journal V., *pp.* 51-54, *February*, 1934.

Details are given of an apparatus used for the examination of the performance of reflecting and refracting glassware. C. A. M.

51. Types of Motor Car Headlights Free From Glare. G. Laurent.

Lux, *pp.* 7-9, *January*, 1934.

An analysis of optical principles and methods involved in the design of headlights with a view to eliminating dazzle. J. S. D.

52. Safety, Economy, Speed in Temporary Lighting Jobs. H. V. Harding.

El. World, 103, *p.* 148, *January*, 27, 1934.

Describes a new form of rubber-covered cable for use in temporary installations. A rubber lamp socket is moulded on to the cord at every ten feet, each socket having an eyelet moulded into its top for suspension purposes. The sockets are claimed to be watertight when fitted with the appropriate lamp. W. C. M. W.

V.—APPLICATIONS OF LIGHT.

53. Progress During 1933. H. W. Richardson.

G.E.C. Journal, *pp.* 6-8 *and pp.* 27-35, *February*, 1934.

Recent progress in many lighting applications is discussed with numerous photographs. Instances given include street lighting, floodlighting aerodrome, cinema, and general interior lighting. New developments of gasfilled lamps are mentioned, together with a new inexplosive lighting fitting for use in explosive atmospheres. C. A. M.

* Abstracts are classified under the following headings: I, Radiation and General Physics; II, Photometry; III, Sources of Light; IV, Lighting Equipment; V, Applications of Light; VI, Miscellaneous. The following, whose initials appear under the items for which they were responsible, have already assisted in the compilation of abstracts: Miss E. S. Barclay-Smith, Mr. W. Barnett, Mr. S. S. Beggs, Mr. F. J. C. Brookes, Mr. H. Buckley, Mr. L. J. Collier, Mr. H. M. Cotterill, Mr. J. S. Dow, Mr. J. Eck, Dr. S. English, Dr. T. H. Harrison, Mr. C. A. Morton, Mr. G. S. Robinson, Mr. W. R. Stevens, Mr. J. M. Waldram, Mr. W. C. M. Whittle, and Mr. G. H. Wilson. Abstracts cover the month preceding the date of publication. When desired by readers we will gladly endeavour to obtain copies of journals containing any articles abstracted and will supply them at cost.—Ed.

54. Architectural Lighting. O. B. Hanson.
Light, 3, *pp.* 6-9. *End of Year*, 1933.
Architectural lighting equipment is used extensively at the Radio City Studios of the National Broadcasting Company. Numerous photographs are given.
C. A. M.

55. Domestic Architectural Lighting. S. H. Kahn.
El. Review, *cxiv. No.* 2929, *p.* 45, *January* 12, 1934.
Describes briefly the electrical equipment, and in particular the architectural lighting of a newly completed villa at Roubaix. J. M. W.

56. Interior Lighting. C. E. Weitz.
Light, 3, *pp.* 15-17. *End of Year* 1933.
A photograph and sketches are given of the application of mercury vapour lamps and incandescent lamps to the lighting of a room with saw tooth ceiling construction. C. A. M.

57. Scholarship Improved by Light. F. C. Albert.
Am. Illum. Eng. Soc., Trans, 28, *pp.* 866-871.
The results of an experiment in two class-rooms are given. In one room four 300-watt fittings were in use, photoelectrically controlled, and in the other two 150-watt units were employed, manually controlled. The ability and alertness of the pupils appeared to be higher in the cases of those working in the first room.
G. H. W.

58. Holophane Colour Lighting. Anon.
El. Times, 85, *p.* 155, *February* 1, 1934.
A brief account of a system of stage and show window lighting employing the three primary colours. Considerable elasticity is claimed for the system, and it is said that any desired colour can be produced.
W. R. S.

59. Industrial Lighting by Discharge Lamps. Anon.
El. Review, *cxiv.*, *No.* 2,932, *p.* 176, *February* 2, 1934.
Describes and illustrates the illumination of the foundry at the Rugby works of the B.T.H. Company by Mazda Mercia lamps in " Muron " lanterns attached to columns. The mounting height is 17½ feet, and spacing 40 feet; the maximum and minimum illuminations are given as 4.25 and 3 foot-candles respectively. The consumption is 0.65 watts/ft.^{2}. J. M. W.

60. New Problems in the Lighting of Streets and Motor Tracks. W. Hagemann.
Das Licht, *pp.* 7-9, *January* 15, 1934.
Describes efforts to deal with the lighting of streets by means of special reflecting and refracting equipment, and alludes to the use of sodium electric discharge lamps. The gain in efficiency is (approximately threefold) partly offset by the high first cost of lamps. A new form of directional projector for lighting motor tracks is described and illustrated. Attention is drawn to the influence of the nature of the track-surface and its changed condition in wet weather.
J. S. D.

61. Improvements in Public Lighting in Brussels. M. Van Mossevelde.
Lux, *pp.* 1-3, *January*, 1934.
The main features of public lighting in Brussels are explained, and the continuous increase in the number of lamps from 1926 to 1932 are illustrated. Methods in use enable the lighting to be diminished by 40 per cent. after 10 p.m. Central suspension is usual, and its use in the Boulevard Emile Jacqmain, where an average of 20 lux (approximately 2 foot-candles) is now provided, is illustrated. J. S. D.

62. The Sodium Vapour Lamp and its Application to Street Lighting. Roger d'Aboville.
R. G. E., 35, *pp.* 93-100, *January* 20, 1934.
The theory and functioning of the sodium vapour lamp are discussed, together with its advantages and disadvantages when compared with tungsten lamps. Several European street-lighting installations using sodium vapour lamps are described and commented upon. W. C. M. W.

63. Sodium Lights at Revere. Anon.
El. World, 103, *p.* 129, *January* 20, 1934.
An installation of eleven sodium vapour street-lighting units has just been erected at Revere, Mass. The lamps are stated to have a light output of 10,000 lumens and to operate on alternating current only.
W. C. M. W.

64. Series Lamps Safeguard Aviators near Stack. Anon.
El. World, 103, *p.* 145, *January* 27, 1934.
A brick chimney 180 feet high has lamps placed at intervals up its height in order to render the obstruction visible to air pilots by night. Special duplicate constant-potential transformers are used, having double secondary windings, each of which supplies three lamps in series. W. C. M. W.

65. Escura Lighting at Enfield. Anon.
El. Times, 85, *p.* 155, *February* 1, 1934.
An account, with two photographs, of a recent installation of gaseous discharge lamps at Enfield. It is said that the colour of the light source has no untoward effects upon the show window displays. The lanterns used are centrally suspended. W. R. S.

66. Street Lighting in the Future. Anon.
El. Times, 85, *p.* 121, *January* 25, 1934.
An abstract of a paper by W. J. Jones read before the Association of Supervising Engineers. Figures are given of cost of properly lit roads and other similar data. The desirability of co-ordination among street-lighting authorities is stressed. W. R. S.

VI.—MISCELLANEOUS.

67. The Applied Science of Seeing. M. Luckiesh and F. K. Moss.
Am. Illum. Eng. Soc., Trans., 28, *pp.* 842-863, *December*, 1933.
A general paper on the science of seeing as it is affected by illuminating engineering. Design, appraisal, and demonstration are considered. Visibility indicators are described. G. H. W.

Artificial Lighting: A Vista of the Future

An address on the above subject was delivered by the President of the Illuminating Engineering Society, Mr. C. W. Sully, at a special meeting held in connection with the British Industries Fair, Birmingham, on February 22. A number of members of Council of the Society travelled up in order to attend the luncheon given to various bodies associated with the electrical industry, and at the subsequent meeting were joined by other members from London and Birmingham, and by exhibitors or visitors to the fair.

In his address Mr. Sully gave an analysis of the part played by the various organisations interested in lighting, and an account of the numerous trades which together form " the lighting industry." A series of problems of importance to the industry and of interest to various Government departments was discussed. Mr. Sully concluded by pointing out the advantages of membership of the Society, which is now seeking to establish local centres in various provincial cities.

In the subsequent discussion Mr. C. Hughes, Mr. W. J. Jones, Capt. W. J. Liberty, Mr. J. S. Dow, Dr. J. W. T. Walsh, Mr. A. Cunnington, and Mr. J. H. Burman took part. The meeting broke up shortly after 4 p.m. in order to afford an opportunity of visiting the Fair.

(Mr. Sully's address and the ensuing discussion will appear in our next issue.)

The Illuminating Engineering Society

Recommendations to Authors of Papers for Presentation before the Society

The Illuminating Engineering Society, in common with other institutions, has experienced the need for some code of procedure in regard to the preparation of papers to be read at its meetings. Such a code fills an evident need—especially in the case of those outside the Society who may not be familiar with the usual practice at its meetings, or the kind of papers desired.

We reproduce below the rules that have now been sanctioned by the Council. Attention may be drawn specially to the No. 4, relating to the time occupied by the reading of papers—a difficult point, but one on which a definite understanding is necessary if adequate time is to be available for discussion!

1. Papers usually occupy 5,000-6,000 words, but the length may be extended when subjects specially demand detailed treatment. Shorter contributions on Specific Problems are also acceptable, either for presentation at " Problems Meetings " or for publication in the Journal. Papers should preferably reach the Hon. Secretary within three months before the dates of the meetings at which they are intended to be read. Papers should be accompanied by a short summary of contents.

2. Manuscripts should preferably be typed on one side of the paper only, and should be presented in duplicate. They should be accompanied by any sketches or photographs which are intended to illustrate the text. Sketches should be executed to a large scale, and in black ink on white cardboard in a form suitable for reproduction. Photographs should have a glazed surface.

3. The Council is prepared to consider papers of a descriptive or statistical nature on any aspect of illumination. Papers embodying results of original investigations or researches are particularly welcome.

4. Papers should preferably not be read in extenso at meetings. The author should present a summary in his own words occupying not longer than twenty-five to thirty minutes (including time occupied by the showing of lantern slides or demonstrations).

5. Technical descriptions of advances in sources of light or apparatus used therewith may with advantage be included in papers, but no trade names should be mentioned, nor should the names of manufacturers be stated, except in the form of a general acknowledgment of information or assistance rendered, which should be inserted at the conclusion of the paper. No trade names or names of firms should appear in any illustrations, or on the lantern slides used to illustrate a paper or discussion before the Society.

6. The Leon Gaster Memorial Premium, to the value of £10 10s., is awarded annually for the best paper or contribution submitted to, and published by, the Society during the session. (The Premium may be withheld in any year in the event of no contribution of insufficient merit being received by the Society.)

A Bureau of Information

We are asked to announce a development of considerable interest to country members of the Illuminating Engineering Society, or members resident abroad—the establishment of what is, in effect, a Bureau of Information.

Members are invited to send in to the Hon. Secretary inquiries in regard to information of which they are in need or requests for help in other ways—for example, in ascertaining the whereabouts of installations of a particular type which they may wish to see. The Hon. Secretary will do his best to answer such inquiries, and in doing so relies on the help of members as a whole. The membership is now of such a representative character that it should be possible to get assistance on almost any technical problem that may be suggested.

As an example one might mention the new electric discharge lamps. Not a few inquiries as to where such lamps may be seen in operation have been received, and it has usually been possible, on appeal to firms interested in such installations, to ascertain some stretch of roadway thus lighted which is easy of access to the inquirer.

The 1934-35 Session Original Papers Needed

It may seem early as yet to be worrying about the programme for the forthcoming 1934-35 session, but there is nothing like taking time by the forelock in such matters.

During recent years the position of the Society in regard to papers has decidedly improved, but there are two respects in which progress is still needed.

In the first place authors who have promised to read papers are still apt to delay the completion of their manuscripts until a few weeks before the actual date of reading. It would be much better if they were available *several months* before, and it would greatly lighten the work of the Papers Committee if they could have several complete papers in hand when the next session opens in October next.

Secondly, may we remind members and others once again that what the Society chiefly desires is papers presenting records of original work—so that everyone may come to look on the platform of the Society as a place where information not available elsewhere can readily be found?

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.—D. K.)

Spec.: No. 402,804, Improvements in Lamp Shades or Reflectors.

For some purposes it is desirable to arrange for more of the transmitted light to be directed laterally, as for example, when the lamps are used to illuminate the narrow corridors of bookshelves. The object of this invention is to provide an improved lamp shade for this purpose. The shade is made of glass and of known shape. Two opposite portions of the shade of suitable shape and size are lightly etched so as to transmit light freely laterally from the source to the side walls. The remaining surface of the shade may be made of opal glass or coated with translucent enamel to reduce the light transmitted.

Spec.: No. 402,954, Calibrating Gas Meters.

This invention relates to a method and apparatus for the testing or calibration of gas meters. According to the invention a gas meter is calibrated by inserting the meter in a closed pipe circuit through which gas is being circulated and in which the gas passing through the meter is comparatively measured by a device in the circuit having no pressure difference between its inlet and outlet sides.

Spec.: No. 402,952, Improvements in or Relating to Headlamps for Road and other Vehicles.

The object of this invention is to provide a very cheap, simple, and effective luminous indicator and signal device which can be easily applicable to cycle and other vehicle headlamps. A hood-like extension is made of transparent or translucent material and is adapted to be mounted on and readily removable from the lamp housing so as to project forwardly beyond the front glass or lens so that it is illuminated by light from the lamp and forms a visual signal to the driver of the vehicle to indicate whether the lamp is alight or not, as well as a luminous signal to other road users.

Spec.: No. 402,937, Methods of Operating Electric Discharge Devices.

The present invention essentially comprises heating the cathode during starting with higher power than is necessary for maintaining its temperature during normal working, and after a definite time from the initiation of the heating, reducing the heating power to normal, such adjustment being made without involving any change in the form of heating employed. Heating-up by this method is considerably shortened, and in the case of hot cathode tubes with vapour filling and arc discharge there is the further advantage that the vapour pressure necessary for working is more quickly obtained.

Spec.: No. 403,068, Improvements in or Relating to Glow Discharge Tubes.

Many known disadvantages are obviated according to the present invention by applying an alternating voltage through a condenser to the electrodes of the glow tubes in addition to the direct voltage. In this case by corresponding proportioning of the series resistance of the tubes, also their load conditions are advantageously altered in accordance with the altered energising voltage. For example, the value of the series resistance is so chosen that the tubes are already under full load at the hitherto used ignition voltages in accordance with the lower ignition point.

Spec.: No. 403,046, Improvements in or Relating to Spectacles and Light Projectors.

Two small projectors provided with electric incandescent lamps are mounted on either side of a pair of spectacles, so as to project light forward to therefore permit reading or lighting one's path in darkness. The light projectors are so arranged as to be independently adjustable in direction. The beam can, therefore, be made to converge to any desired point, or each projector can throw the beam in opposite directions.

Spec.: No. 403,037, Device for Obtaining Position of Vessels by Roentgen Rays.

The present invention relates to an arrangement for determining the position of vessels of any nature, including air vessels, relatively to a given point by means of Roentgen rays emitted from said point, which may be referred to as the beacon, the direction of the rays emitted being determined on board the vessel by means of an apparatus, consisting of a plate, which becomes luminous when acted upon by the said Roentgen rays, in combination with a sighting device, constructed of materials that are impervious to such rays.

Spec.: No. 403,155, Improvements in or Relating to Electro-Optical Apparatus.

This invention is for improvements in or relating to the construction of Ken cells. The specification is a very long one, and therefore I am going to confine myself to claims 1 and 2. A Ken cell electrode assembly comprising thin sheet metal electrodes, the edges of which are interleaved with fusible spacing pieces and end plates, the edges of which are fixed together to form a corporate whole. A Ken cell electrode assembly, according to claim 1 in which the said sheet metal electrodes have lugs projecting from the assembly for the purpose hereinbefore set forth.

Spec.: No. 403,286, Improvements in or Relating to Luminous Signs.

This invention deals with luminous signs, but more particularly with the type of sign employing Neon or other rare gas tubes for the purpose of illumination. The object of the invention is to provide a luminous tube sign which is neat and attractive in appearance both by day light and at night, and which may be cheaply made. One other desire is to make an arrangement which is entirely self-contained; that is, actually accommodating the transformer in such a way that neither the tubes of the sign nor the surface to which the sign is to be fixed will be in any way disfigured.

Spec.: No. 403,252, Improvements in Photometric Apparatus.

The invention describes how two rectifier copper oxide or the like photo cells are connected in series to form two adjacent arms of a bridge circuit and a galvanometer is situated in the diagonal branch of the bridge. By this means measuring is simplified in that the deflection of the galvanometer in the diagonal branch of the bridge allows the absorption or extinction to be directly read on the galvanometer scale. The specification goes on to describe further means of increasing the measuring accuracy and methods of construction.

Garden Lighting: A Charming Picture which appears in a new leaflet about to be issued.

Floodlighting the Garden

THE floodlighting of gardens is a sign of the times—whether a good one or a bad one is a subject around which there has been, and continues to be, considerable controversy. Undoubtedly, as in the illustration reproduced above, it is possible to attain some very charming effects when the lighting is tastefully and scientifically controlled and arranged. It cannot be denied, however, that the greatest possible care must be exercised in this direction, otherwise the argument which so many people put forward may very well be justified—namely, that the artificial floodlighting of gardens is a synthetic and not very successful attempt to emulate daylight, and that it is, in short, an intrusion into the beauty of the night.

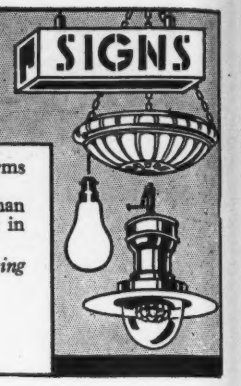
The subject is one which is shortly to be discussed by the Illuminating Engineering Society, and the view put forward on that occasion may well be of considerable interest.

We show above an example of modern garden floodlighting, achieved with taste, and in no way offending the senses. The illustration is taken from a leaflet shortly to be produced by the well-known lighting firm of Allom Brothers, Ltd.

We have been favoured by an advance copy of this leaflet. The get-up and assembly are interesting and unusual, a feature being the series of illustrations showing the varied applications of the system of lighting with which the name of the firm is associated.

Among the installations described we note the Sargent Room at the Tate Gallery, Imperial Chemical House, and the Dorchester Hotel. The two latter involve floodlighting with 1,000-watt units. The lounge at the Dorchester Hotel is a very pleasing indirect installation, light being received mainly from recessed domes in the ceiling. The Monseigneur Restaurant installation is chiefly remarkable as an instance of highly efficient cornice lighting—lamps being spaced at much greater intervals than would ordinarily be considered permissible without the uniformity of effect suffering. At the end of the leaflet particulars are given of the artificial lighting of tennis, racquets, squash racquets, and badminton courts, for which illuminations up to 30 foot-candles have been provided.

·WHERE TO BUY·
A DIRECTORY OF LIGHTING EQUIPMENT



We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3½ inches wide) are given below.

These terms are equivalent to **half our ordinary advertising rates,** but not less than 12 successive monthly insertions can be accepted on this basis, and amounts are payable in advance.

Payment for an advertisement in this section entitles the advertiser to receive *The Illuminating Engineer* during the period of the contract.

Terms:	12 Successive Monthly Insertions	£3 10 0	Payable
	24 " " "	£6 0 0	in
	36 " " "	£8 10 0	Advance

MODERN LIGHTING FITTINGS
New Catalogue on application
Fittings manufactured to Architects' Specifications
ASCOG LIMITED
Ascog House, 44, Theobalds Road, LONDON, W.C.1

ELECTRICITY SERVICES LTD.
Electrical Engineers
Sole Proprietors and Patentees of
THE "TYPERLITE" ADJUSTABLE
LOCAL LIGHTING UNITS
Write for Price Lists: **86, CANNON ST., LONDON, E.C.4**
Mansion House 5294 (3 lines)

PHOTOMETERS
for testing candle-power and illumination. Benches, Cubes, Heads, Standards of Light, Special Fittings and Accessories.
ALEXANDER WRIGHT & CO., LTD.,
1, Westminster Palace Gardens, Artillery Row, Victoria St., London, S.W.1

INDUSTRIAL LIGHTING SPECIALISTS
Cast Iron Columns *Street Lanterns*
Fuses ELEC Co. Ltd. *Winches*
Time-Switches *Contact Gears*
ENGINEERING & LIGHTING EQUIPMENT COMPANY LTD.,
ST. ALBANS, HERTS.

ALLOM BROTHERS LTD.
16, GROSVENOR PLACE, LONDON, S.W.1.
Specialists in the Science of Modern Lighting, including:
Theatres and Public Halls. Tennis and Racquet Courts.
Pictures and Picture Galleries. Floodlighting, etc.
Decorative Fittings in Glass and Metal.

"ESLA"
BI-MULTI AND MULTIPLANE REFLECTORS
Lanterns, Brackets, Columns, Switch and Fuse Boxes, etc., FOR STREET LIGHTING
The Electric Street Lighting Apparatus Co.
The Foundry, Canterbury

BENJAMIN
PLANNED LIGHTING
You get the benefit of over twenty years' experience in the science of Commercial & Industrial Illumination when you specify Benjamin.
THE BENJAMIN ELECTRIC, Ltd., TARIFF ROAD, N.17

FLOODLIGHTING & FITTINGS LTD.
294, GRAY'S INN ROAD, W.C.1

Manufacturers of "FLOOD" Units
Specialists in Modern Lighting Fittings
Telephone: TERMINUS 5954.
Model "B"

BROMFORD
Seamless Steel Lighting Standards.
Traffic Signals. Guard Pillars
for all requirements
BROMFORD TUBE CO., LTD., ASTON, BIRMINGHAM

Controlled Diffusion and Distribution of Light for Industrial and Architectural Illumination
G.V.D.
ILLUMINATORS
Aldwych House, LONDON, W.C.2
Laylights, Cornice and Pillar Lighting. Pendant Fittings and Standards (Direct and Indirect)

REINFORCED CONCRETE LAMP COLUMNS
CONCRETE UTILITIES, Ltd.
WARE, Herts.

GOWSHALL LIMITED THE TRAFFIC ENGINEERS
MINISTRY OF TRANSPORT ILLUMINATED ROAD SIGNS AND "GUARDIAN ANGEL" GUARD POSTS, LAMP COLUMNS, ETC.
Conway Hall, 49, Theobalds Road, London, W.C.1
Chancery 7042

DAWSON REFLECTORS
Indoor and Outdoor Floodlights
JENA REFLECTOR FITTINGS.
Miss E. H. DAWSON & HENCKEL,
42, Gray's Inn Road, London, W.C.1
Telephone: Chancery 8801.

HAILWOOD & ACKROYD, LTD.
BEACON WORKS, MORLEY, Near LEEDS
Sole makers of "HAILWARE" British-made Illuminating Glassware and Fittings, Traffic Globes and Signs, Island Columns and Footlights.
Offices and Showrooms at:—
71/75, New Oxford St., London, W.C.1. 314a, St. Vincent St., Glasgow. Carlton House, 28, High St., Birmingham.
Ulster Agent: **Messrs. Bell & Hull, 17, College Street, Belfast.**

Specialists in
ARCHITECTURAL ILLUMINATION AND DESIGNS
DRAKE & GORHAM LTD.
36, GROSVENOR GARDENS, LONDON, S.W.1
Manchester, Glasgow, Exeter and Winchester.

Specify
HOLOPHANE
(Scientific Illumination)
ELVERTON ST., LONDON, S.W.
for
STREET CHURCH INDUSTRIAL
CINEMA FLOOD SCHOOL, Etc.

E.L.M.A. Activities

"Safety First"

IN an age when life seems to grow daily a more perilous affair, we have good cause to render thanks for the admirable work of the National Safety First Association. Known to the general public principally for its untiring efforts to reduce every type of accident on the road, the Association has also been instrumental in the preservation of life and limb in almost every department of modern life.

The Association has an active appreciation of the value of good lighting as a safety factor and co-operates closely with the electric lighting industry in its efforts.

Recently two meetings have been held at the E.L.M.A. Lighting Service Bureau, one of which was attended by the Association's Industrial Safety Committee, and the other by the Home Safety Committee, lectures being given on both occasions by members of the staff of the Bureau.

Members of the Industrial Safety Committee were given a comprehensive survey of the most recent developments in industrial lighting, and were particularly interested in statistics which gave conclusive proof of the marked decline in the number of accidents in factories where a high standard of lighting has been installed.

The Home Safety Committee heard a lecture from Miss Noakes, the Bureau's home lighting specialist, in which home lighting was considered from its purely practical aspect, Miss Noakes suggesting many ways in which the introduction of a few extra lamps conveniently placed could serve to avoid minor discomforts as well as serious accidents in the home.

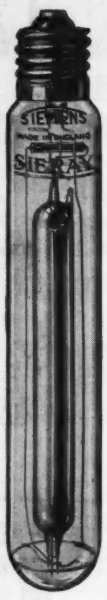
A New Siemens Discharge Lamp

THE attainment of a light approximating closely to true north daylight has long been a problem confronting the illuminating engineer. That this type of light is eminently desirable for almost all industrial and commercial locations has been abundantly shown on many occasions, but hitherto all efforts at the attainment of artificial daylight have been associated with colour filters, screens, or pigmented reflector surfaces, with their tremendous light absorption properties, and consequent need for extremely high current consumption.

The early forms of hot cathode gaseous discharge lamp did little or nothing to solve this problem. Of course, they effected enormous economies in current consumption over the gas-filled tungsten filament lamp, but the light which they gave was noticeably deficient in rays at the red end of the spectrum, with the result that colours viewed by their light appeared distorted, blues and greens being over-emphasised, whilst reds tended to appear a dingy brown.

In an effort to restore the balance of red rays, tungsten filament lamps or neon tubes were used in conjunction with these lamps, but, of course, this was little more than a compromise, since the overall efficiency of the installation was reduced, and the two wrongs failed signally to make a right.

Those of us who came into contact with the lamps found the effect on the human features most noticeable and most unpleasant. It was, hence, an occasion of interest when we were invited recently to attend a demonstration given by Siemens to see for ourselves the manner in which this problem had been tackled by their laboratories, and the results which they had obtained.



The scheme employed (one which, incidentally, is the outcome of intensive research on the part of Mr. J. Aldington, of the Siemens laboratories) in the new Siemens lamp is one by which the mercury and argon content of the old gaseous tube is replaced by certain other metallic vapours the emission spectra of which are substantially complementary. The resulting light is claimed to approximate closely to that elusive standard, " true north daylight." Certain it is that this lamp constitutes a marked advance in the science of illumination. The demonstration we witnessed consisted of three cabinets, each containing various clearly-coloured objects such as fruit, flowers, and coloured materials. Each cabinet contained precisely similar articles, but each was differently illuminated.

The first took its light from an early type 400-watt Siemens Sieray discharge lamp, the second, from a later type Siemens Sieray " X " lamp, and the third from the new " W " lamp.

It is extremely difficult to paint a picture in words, and we must content ourselves with saying that the difference was very striking—an ample vindication of the claims put forward.

Only under the new " W " lamp were colours really appreciable and really natural.

Technically, this new lamp embodies several other new discoveries and developments emanating from the Siemens laboratory.

Thus, while in the earlier forms of gaseous discharge lamps a starting wire was fixed around the inner tube of the lamp which operated as a starting device, the new method which is employed embodies auxiliary electrodes in proximity to the main electrodes, the former being connected together through a resistance, but not connected in any way to the lamp terminals. These auxiliary electrodes have the effect of setting up preliminary discharges at the main electrode, thus starting the main discharge, which then carries the full lamp current, and thereby automatically cuts out the auxiliary electrodes.

This new striking device gives two main advantages:—

(1) The elimination of the starting wire around the inner tube minimises the bulb blackening which takes place during the life of the lamp.

(2) With this device the lamp will operate successfully on an A.C. supply from 200 volts and upwards, thereby widening the field of use of this lamp as compared with the old type of starting device, which was not always reliable on circuits below 230 volts.

Finally, we may justifiably say that a substantial stride forward has been made by this new lamp, and we extend our congratulations to Messrs. Siemens on their achievment.

A New Type of Motor Bulb

Of Use in Fog

Foggy weather has been so prevalent this year, and the fog has been so much in the public eye in more ways than one, that it is interesting to note that Phillips Lamps, Ltd., have produced a new motor lamp bulb which is yellow in colour and which is claimed to be decidedly effective in fog.

In addition to this quality, Messrs. Phillips claim to have eliminated the blue and violet rays from the light, and hence to have produced a lamp which gives a dazzleless light.

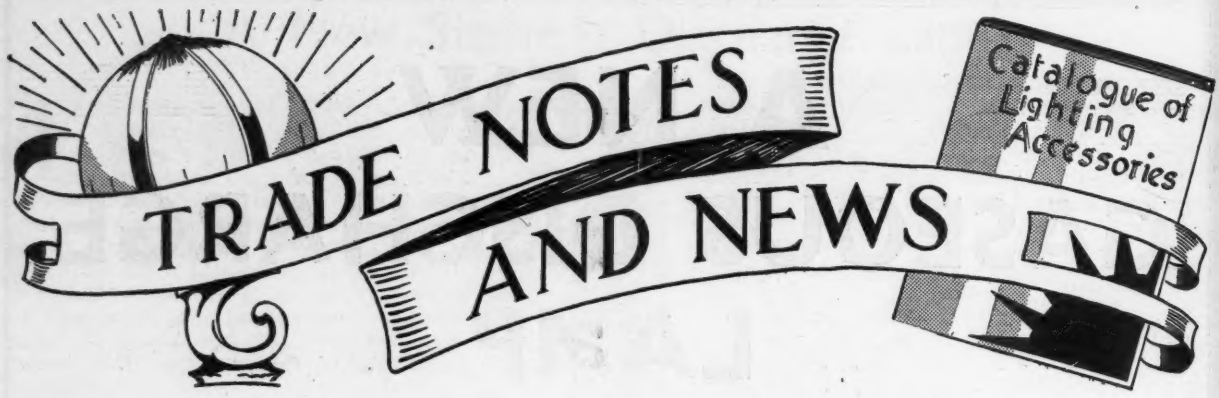
The lamps are moderately priced at 3s. 2d. for the ordinary 36-watt type.

The Lamp Selection Chart

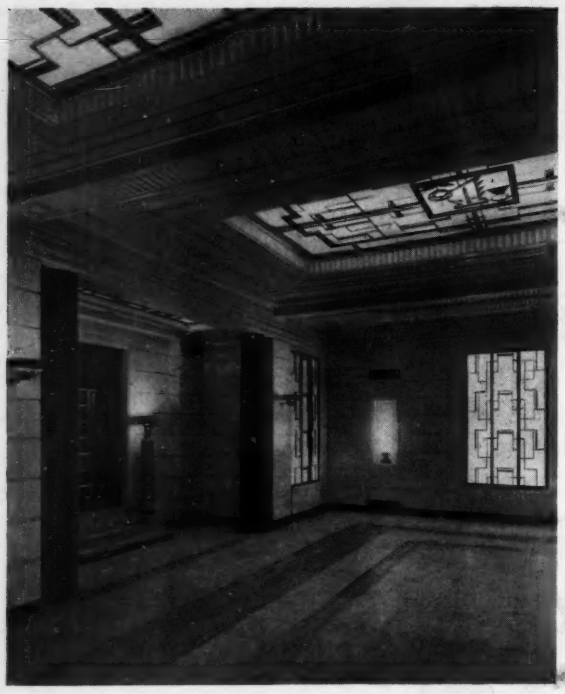
This is the title of a new chart just issued by W. Parkinson and Co. of Birmingham, executed in colour and enabling the appropriate lamp to be selected to satisfy conditions for certain classifications of streets according to the B.S.I. Specification—a decidedly timely and enterprising effort.

Patent Offered

THE proprietor of British Patent No. 268293, dated March 25, 1926, relating to " AUTOMATIC CUT-OFF VALVE," is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above patent and ensuring its practical working in Great Britain. Inquiries to B. Singer, Steger Building, Chicago, Illinois.



Good Laylighting



Well designed laylighting is a joy to the eye, and an outstanding example of the really excellent uses to which modern architectural lighting can be put.

The photograph shown here is of the Central Enquiry Bureau of the London Midland and Scottish Railway Company, and the whole of the illumination here is achieved by the G.V.D. lighting system. The architects responsible for this scheme were Mr. A. V. Heal, F.R.I.B.A., and Mr. W. H. Hamlyn, A.R.I.B.A., the contractors being Messrs. John Mowlem and Co. A feature of the installation is its economy—the windows shown are each 10 ft. 6 in. by 5 ft. 6 in., and each is illuminated by only two lamps, each 200 watts in power.

Firms having new or interesting products which they wish to bring before the notice of the public are invited to make use of the Trade Notes Section. Matter, which should preferably be accompanied by a block or illustration, should reach the offices of "The Illuminating Engineer" not later than the 15th of the month prior to publication.

For Multiple Lighting

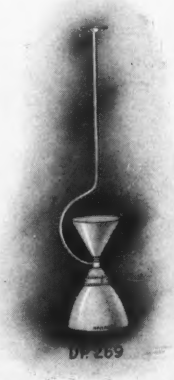
In locations where there is the call for multiple lighting, the new Beeantee holder would seem to be invaluable. By means of this holder a novice can install 150 lamps in an hour, with the current switched on, without fear of shocks or short circuits.

It is claimed that these holders are interchangeable, watertight, unaffected by climate, and entirely reliable. They dispense with all screwdrivers, screw, cutting, insulating, etc., and make the job of wiring a a large number of lamps one of complete simplicity.

The small diagram shows the simplicity of wiring.

A Lighting Fitting for Hospitals

An interesting fitting which we have received for review from Messrs. Hailwood and Ackroyd, Ltd., of Morley, consists of a "Hospital Two-Light Pendant" with three-ply opal glassware. This fitting is made to hold an electric light lamp in each shade, and the lamps are controlled by separate switches. Thus, when occasion demands a bright light for inspection purposes, etc., the direct light can be switched on, and when indirect or soft light is called for the upper light can be switched on. These fittings cost only 20s. 6d., and should prove a real boon for hospital ward lighting.



GAS LIGHTING IN A MODERN FOUNDRY

This is a good example of those numerous cases in which efficient overhead lighting is desirable, leaving a complete clear space below for the carrying out of work.

FOUNDRY lighting presents some peculiar problems of its own, and no greater mistake can be made than to imagine that on account of the relative roughness of the work performed in these locations, the lighting may be installed in a haphazard manner.

A systematically planned installation of gas lighting in the new foundry of the Coronium Metal Company, of Western-road, Reading, is the subject of our illustration, reproduced above.

This photograph was taken at night by the artificial light only, and the uniformity and absence of shadow is commendable.

The lighting is achieved by seventeen four-burner Sugg's "Swanley" lamps, and two eight-burner "Swanley" lamps.

We understand that the resultant candle-power is in the region of 7,720, while the consumption of gas is 225 cubic feet per hour. The total area of the foundry is 7,200 square feet, and the lamps are suspended on 15-foot centres, the four-burner lamps being hung at a height of ten feet from the ground and the eight-burner lamps at a height of eighteen feet.

Contracts Closed

SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED.

The General Post Office—for the supply of several thousand special inspection lamps.

The Post Office Stores Department—for the supply of a large quantity of Siemens Automobile lamps.

The Dublin United Tramways Company—for the supply of electric lamps and electrical accessories during 1934.

The Admiralty—for a large number of special Siemens battery lamps for Signalling.

The Admiralty—for a large quantity of Siemens gasfilled and vacuum lamps for use on board ship.

THE EDISON SWAN ELECTRIC COMPANY, LTD.

The Admiralty—in respect of carbon filament lamps.

The Great Southern and Great Northern Railways, Ireland.—The Great Southern Railways—for the supply of train lighting lamps during the twelve months commencing 1st inst. *The Great Northern Railway*—for approximately 75 per cent. of their total requirements of ELMA lamps during 1934.

The London Midland and Scottish Railway—for a portion of their requirements of Royal Ediswan lamps during sixteen months ending April 30, 1935.

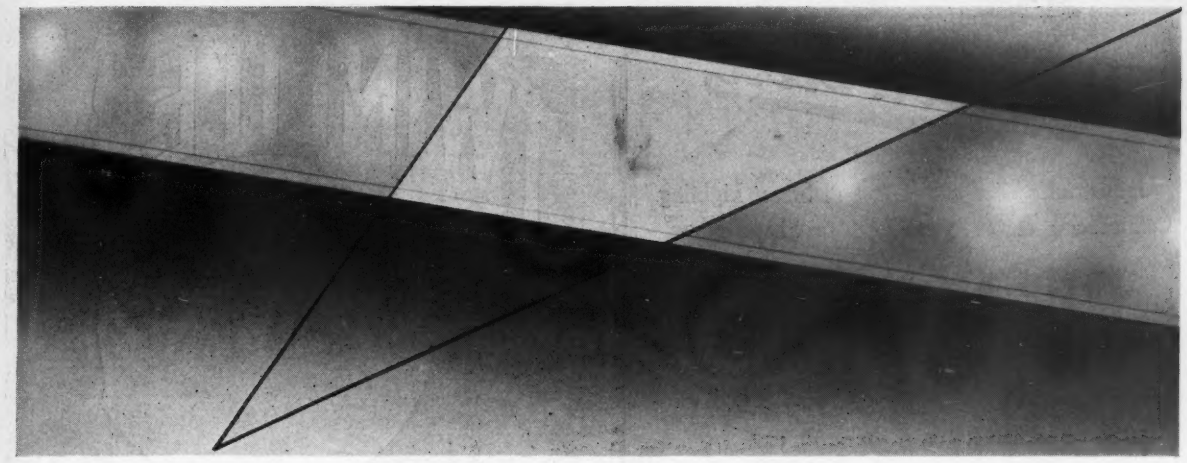
THE GENERAL ELECTRIC COMPANY, LTD.

The Dublin United Tramway Co. (1896) *Ltd.*—for the supply of 12 months supplies of Osram and Robertson electric lamps.

The London Midland and Scottish Railway Co.—for the supply of Osram metal filament gasfilled and vacuum lamps and Robertson lamps for 16 months.

OBITUARY

We learn with great regret that Mr. Richard Taylor, Lighting Superintendent of Bolton, passed away on February 4th. Mr. Taylor devoted himself unsparingly to his work at Bolton. Members of the Association of Public Lighting Engineers will hear of his death at the early age of 57 with deep regret.



Eliminating "Patchiness"

in Architectural Lighting

UNEVEN lighting will mar the most ambitious scheme. But appearance is not the only consideration. Multi-bulb installations are costly to instal, to maintain and to run. In a G.V.D. assembly

ONE BULB DOES THE WORK OF MANY

Uniform distribution of light over the entire area is achieved at a fraction of the normal cost. From a structural standpoint, the advantages of G.V.D. Lighting are no less remarkable. Compactness, for instance—a G.V.D. laylight requires an average of only twelve inches ceiling depth. Reduction of heat obviates the need for special ventilation, and minimises attraction of dust. The thinnest glass may be used, enabling Architects to utilise the many novel and attractive patterns now available, without fear of cracking or exposing the sources of light, whilst the beauty of patterned glass is seen to the best advantage.

In addition to utility lighting, the G.V.D. System

WIDENS THE SCOPE FOR LIGHT AS A DECORATIVE MEDIUM

It enables Laylights, Cornice, Panel and Pillar Lighting to be incorporated in the most modest buildings.

ARCHITECTS and Consulting Electrical Engineers are offered the fullest co-operation on any lighting problem.

Demonstration units may be seen at our Showrooms or a descriptive CATALOGUE will gladly be sent upon request.

G.V.D. ILLUMINATORS
(G. V. DOWNER)

ALDWYCH HOUSE, ALDWYCH, LONDON, W.C.2
Telephone: Holborn 8879.

CONTRACTS INCLUDE :—

TATE ART GALLERY
BRITISH MUSEUM
WORLD ECONOMIC CONFERENCE
UNIVERSITY OF LONDON
BIRKBECK COLLEGE
BRITISH INDUSTRIES HOUSE
LIBERTY & CO., LTD.
HEAL & SON
UNITED STATES LINES
CENTRAL ELECTRICITY BOARD
BOMBAY ELECTRIC SUPPLY AND TRAMWAY CO., LTD.
SHANKS & CO., LTD.
AQUASCUTUM, LTD.
ODHAMS PRESS, LTD.
PERRY & BELL
D. NAPIER & SONS, LTD.
HUTCHINSON & CO., (Publishers) LTD.
CINEPRO, LTD.
WARGRAVE HALL
L.M.S. OFFICES, EUSTON

The G.V.D. System is entirely BRITISH and patents are applied for in all principal countries.

The Loss of Light Occasioned by Ceiling Blackening

An Interesting Experiment

AN experiment of an interesting nature was recently carried out in Austria by Walter Glaser and Paul Grundfest with the object of determining as far as possible the actual effect on light intensities of dusty or smoky atmospheres. For the purpose of the experiment a cubical box was constructed, each side measuring 50 c.m. long. The inside was painted matt white and one side had a circular opening into which was fitted the photo cell of an objective luxmeter. Inside the box an electric lamp was suspended, so arranged, by means of a screen, that only the reflected rays fell on the photo cell, and in this manner the internal illumination was measured.

In order to get the effect of gradual ceiling blackening the inside of the roof of the box was covered with grey paper; first 10 per cent. of the area, then 20 per cent., and so on in progressive stages until the entire roof of the box was covered. Relative intensities were recorded on the Luxmeter and noted. The results obtained showed that while the reflection factor of the ceiling in its original matt white condition was 90 per cent. and that of the grey paper 33⅓ per cent. when the ceiling was half covered with grey paper, the factor became 66.6 per cent., the remainder of the light falling on the ceiling being absorbed. Several experiments were made, and the results are given in the table following.

Ceiling.	Reflection Factor.	Luxmeter Readings.
10% grey	90%	118
20% ,, ...	84%	114.6
30% ,, ...	78%	112.6
40% ,, ...	72%	109.6
50% ,, ...	66%	106
60% ,, ...	60%	103.6
70% ,, ...	54%	102
80% ,, ...	48%	99
90% ,, ...	42%	97.3
100% ,, ...	36%	95.6

From the above table we observe that by darkening the ceiling so that the reflection factor is diminished to 60 per cent. the illumination intensity (the source being constant) decreases from 118 lux to 103.6 lux; that is to say, 12.2 per cent. These figures are of interest. When we consider that in any working conditions not only the ceiling, but also the surrounding walls and illuminating source itself will become discoloured or dusty, we can see that the decrease may easily amount to a total of 50 per cent. or more per cent.

It is recognised that the cleaning of ceilings and walls is in general a large and expensive task, especially when they are painted white. This difficulty is often overcome by means of covering the ceiling by sheets of smooth glass which can be kept clean by means of a damp cloth. The cracks between the glass are filled up with rustless metal which also serves to keep them in position. It would seem that this application of glass as a ceiling covering material, especially in hotels, restaurants, and similar locations, opens up an interesting field of investigation for architects and illuminating engineers.

B.T.H. at the B.I.F.

One of the four sides of the Mazda Stand at the B.I.F. Castle Bromwich, depicting, by an enlarged photograph 12 ft. wide, Mazda Mercra lighting at the Margate Miniature Golf Course. The lanterns used in conjunction with Mercra Lamps for this installation were B.T.H. CIRCRA, one of which is shown in the foreground.

Street Lighting in Leicester

Just at the present time, when there is a great deal of consideration being given to the question of road safety, it is pleasing to hear that the number of new street-lighting installations in the country is on the increase.

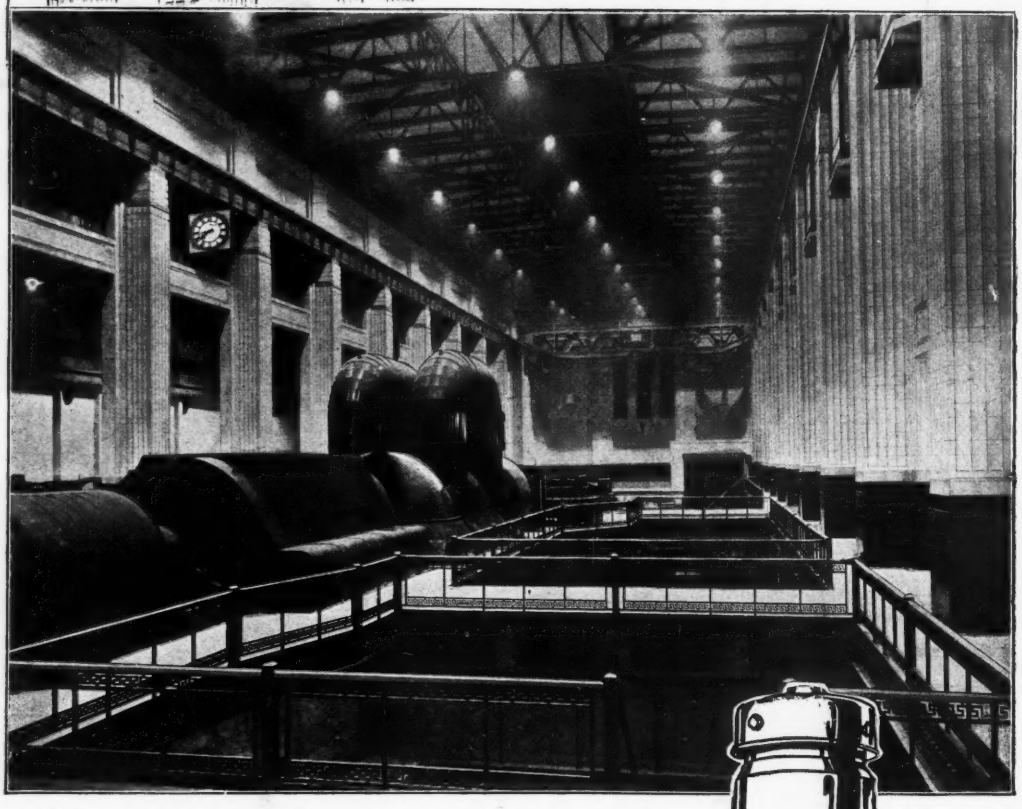
The example we show here is one which has been erected in Leicester by the Leicester Corporation Street-Lighting Department.

A large number of Ediswan "London" type street-lighting lanterns equipped with high-efficiency asymetric refractors are employed. These are suspended from tramway standards and "staggered." 200-watt Royal Ediswan lamps are used.

BATTERSEA

The New Power Station for The London Power Company

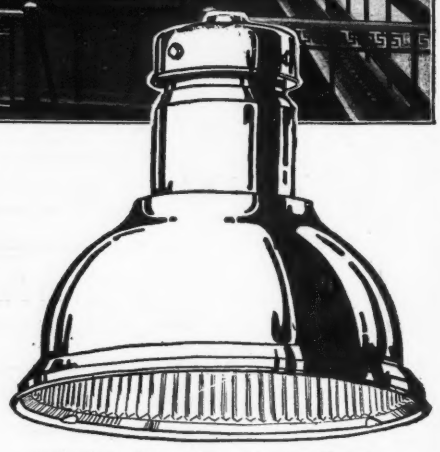
EQUIPPED



A night photograph of the Turbine House lighted by 1,000 watt Holophane heavy duty units

with

HOLOPHANE Lighting



Holophane Heavy Duty Focusing Type Unit.

The lighting of the Battersea Power Station has been carried out to a carefully planned scheme drawn up by the Engineers of Messrs. The London Power Company.
Holophane lighting has been specified and installed for all major positions in this power station undertaking.
The Electrical Contractors for this outstanding installation were Messrs. G. E. Taylor & Co., of 7, Suffolk Lane, Cannon Street, London.

Technical Booklet entitled "Scientific Industrial Illumination" written by an expert, giving practical advice, and profusely illustrated, will gladly be sent free. We should welcome the opportunity of giving a survey and specification without obligation.

HOLOPHANE, LTD.
1, ELVERTON STREET, VINCENT SQUARE, LONDON, S.W.1
Telegrams: "Holophane, Sowest, London." Telephone: VICtoria 8062 (3 lines)

Printed by the Argus Press, Ltd., Temple-avenue and Tudor-street, London, E.C.4.